Spirometrics

# FLOWMATE III USER'S MANUAL

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## *Congratulations...*
## *You have a lot to look forward to with your new Flowmate III!*

You have purchased a Spirometrics Medical Equipment Co. Flowmate III spirometer. The brilliant simplicity and unmatched performance of the Flowmate III will allow both you and your patients to benefit from spirometry.

For generations, Maine's reputation for affordable, quality craftsmanship has endured the test of time. It is this heritage which has inspired the people at Spirometrics. We are proud to be a Maine-owned and operated company, and are dedicated to sharing Maine's tradition of excellence with you. Spirometrics has created a complete line of premium diagnostic, lung function testing equipment. For over 16 years we have been helping the world's most successful health facilities achieve a common goal...providing quality health care.

## How To Use This Manual

This guide is arranged by category for your convenience. If you have any additional questions about this product or would like information on the full Spirometrics' product line, please call **Inside Sales** at **800-767-0004.**

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## Definition of Statements

**WARNING**: This manual outlines the correct method of operating Spirometrics' Flowmate III. These guidelines must be followed in order to ensure safe operation.

**CAUTION:** Means there is a possibility of procedures which, if not observed, could result in damage to equipment.

**NOTE**: Notes provide points of important information for more efficient and convenient operation.

## INTRODUCTION TO THE Flowmate III

### Features

- Compact design and battery-powered portability
- Unit memory 5 patients (optional memory card allows for additional 118 patients)
- Automatic calculation and optional test interpretations
- Menu-driven simplicity
- Bacterial/Viral filter
- Compliance with ATS, NIOSH and OSHA standards

Please read this manual carefully before setting up and operating your new Flowmate III.

STOP!

BEFORE SETTING UP, PLEASE COMPLETE THE ATTACHED WARRANTY CARD ON THE NEXT PAGE TO ENSURE THAT YOUR WARRANTY RIGHTS ARE COVERED.

For the device warranty to be in effect, the attached warranty card must be returned to Spirometrics Medical Equipment Co. for warranty registration. Please take this time to fill out the enclosed postage paid warranty card. You may also register your warranty by calling 800-767-0004 or 207-657-6700 or faxing the information to 207-657-4123.

All Spirometrics spirometers are warranted to be free from defects in workmanship and material for a period of TWO YEARS from the date of purchase as validated by the return of the warranty card. If the warranty card is not returned or otherwise registered by phone, the two-year warranty begins from the date of manufacture.

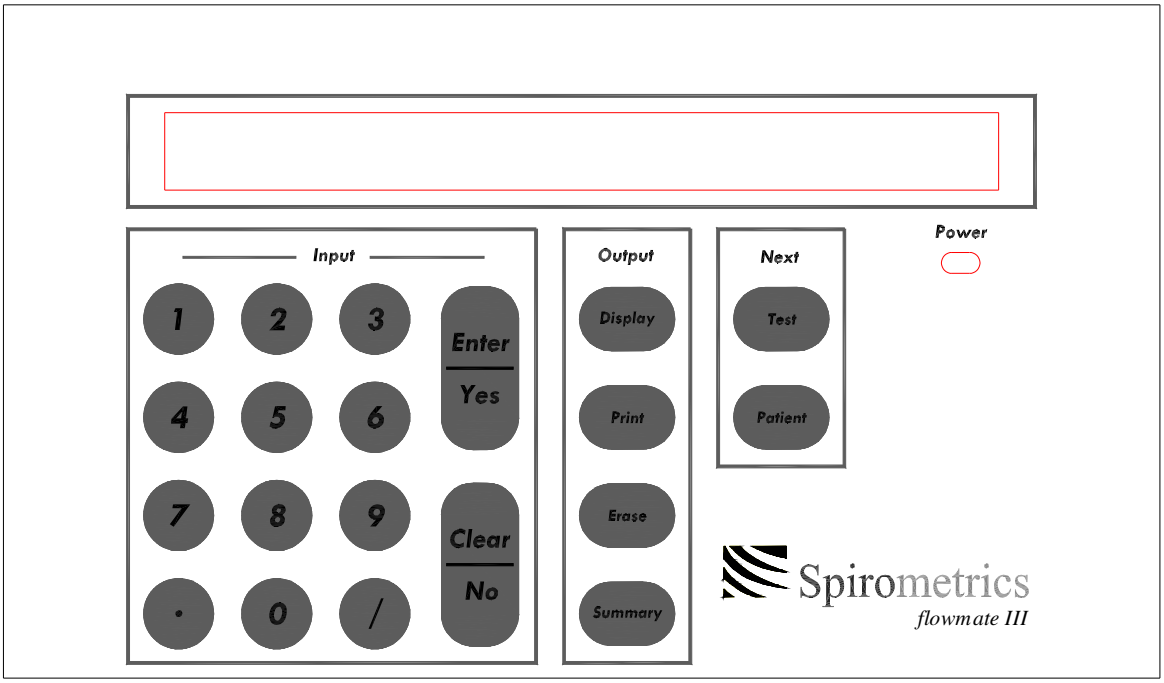
During the warranty period, any and all original parts and or workmanship proven to be defective will be replaced or repaired at an authorized service center provided the equipment has been operated and maintained in accordance with the instructions contained in the Operator's Manual. This warranty applies to the original user only, is not transferable, and does not extend to any product or component which has been repaired or altered by anyone other than personnel authorized by Spirometrics. This warranty is in lieu of and excludes any warranty as to merchantability and all other warranties expressed or implied and does not cover consequential damages due to improper use or application of the product.

## Warranty Card

This page set aside for the WARRANTY CARD insert.

This page is intentionally left blank for warranty card attached to the previous page (WARRANTY CARD insert).

## MAIN KEYBOARD



**PATIENT KEY** - This key allows you to clear the current screen at any point during calibration, customization or a test in order to start over at the Main Menu.

**MAIN MENU**

⇩

⇨

MENU
1= Patient
2= Customization
3= Calibration
4= Time (or Output)

By pressing the following keys at the MAIN MENU you may access the following options:

| INPUT | RESULT |
|---|---|
| **By Pressing** ❶ | You can enter patient information and testing mode. |
| **By Pressing** ❷ | The customization parameters can be modified. |
| **By Pressing** ❸ | You may set and check the calibration of the spirometer. |
| **By Pressing** ❹ | You can set the correct date and time. |

**TEST KEY -** Displays the test option selections. Once you select the test you would like, you are in TEST MODE.

⇨

Which test would you like?
1=FVC
2=MVV
3=VC
4=CHAL (or Output)

**DISPLAY KEY -** At Main MENU the display indicates how many patients are stored either in unit memory or RAM card memory (if RAM card is installed).

⇨

| | |
|---|---|
| Database usage: | SYS MEM: 1 of 5 (Press any key) |

In **TEST MODE** this display cycles through test indices on the display.

⇨

| Index | Unt | Meas | Pred | %Pred | %Var |
|---|---|---|---|---|---|
| FVC | L | 3.67 | 2.86 | 128 | n/a |

"SCROLL THROUGH INDICES" ⇩

| Index | Unt | Meas | Pred | %Pred | %Var |
|---|---|---|---|---|---|
| FVC | L | X.XX | X.XX | XXX | n/a |

Press **DISPLAY** ⇩

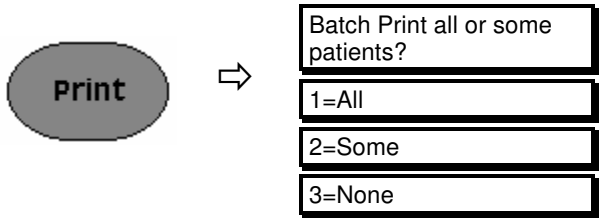
| Index | Unt | Meas | Pred | %Pred | %Var |
|---|---|---|---|---|---|
| FEV1 | L | X.XX | X.XX | XXX | n/a |

⇩

Repeatedly Press DISPLAY To Scroll Through the Indices.

**PRINT KEY -** Prints reports after a test is given when printer is present.

At the Main MENU when you press PRINT you can choose to print specific patients or all patients.




| INPUT | RESULT |
|---|---|
| **By Pressing** ❶ | Prints all patients in storage (including memory card if installed). |
| **By Pressing** ❷ | Prints desired patient tests. You must first enter the patient ID Numbers you would like printed (after pressing ❷ for "some" patients). |
| **By Pressing** ❸ | This will bring you back to the Main MENU. |

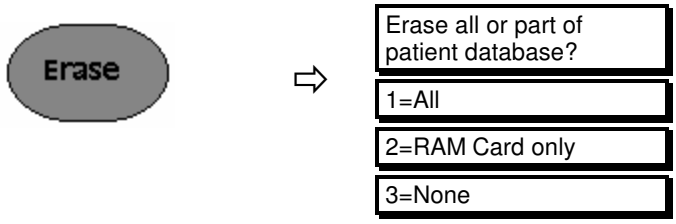
In Testing Mode you can print reports after a test is given, when a printer is present.

**SUMMARY KEY** -

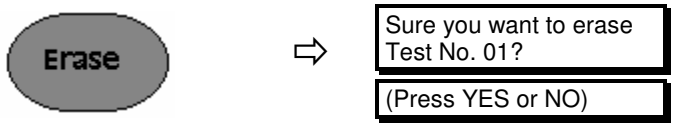
In the Main MENU you can print out a directory of the patients in the system memory and optional memory card. The patient directory lists patients by ID number, age, and gender.

In testing mode you can print the Best Test Summary Reports.

**ERASE KEY** - At Main MENU erases test data (but, only if confirmed).

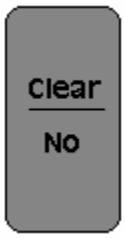



In Test Mode you can erase selected tests.




When Entering Patient Information :

⇨ Indicates YES, or enters responses.




⇨ Indicates NO, or clears last response.

⇨ •Press once = Will erase last character entered.
•Press twice = Will erase last entry.

# INSTALLATION AND CUSTOMIZATION

This section provides you with information on the rechargeable batteries, printer connection and customizing the Flowmate III to meet your needs.

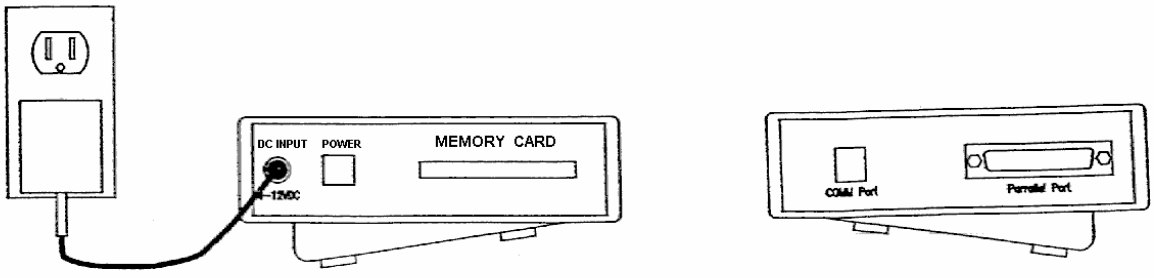
**Battery Information-**

The Flowmate III is equipped with six standard AA NiCad rechargeable batteries for portable operation and a dual colored power light. A GREEN POWER light in battery operation will indicate that the spirometer is fully charged. A beeping sound and a RED POWER light indicates low battery power. If the battery power is low, the spirometer can be used while being powered by the AC adapter.

**Charging Batteries-**

Charging the Flowmate III is a simple procedure. Spirometrics recommends that batteries be charged for at least 15 hours before portable operation. The battery power will deplete after approximately 4 1/2 hours of continual use. To charge the spirometer, connect the AC adapter to the spirometer and plug it into a standard AC outlet. The power switch can be in the "on" or "off" position while the unit is charging. The battery will charge while the spirometer is in use with the AC adapter or when the power switch is off.

**NOTE**: As with all NiCad batteries, it is important to periodically allow the battery to be completely depleted before recharging. This practice will ensure maximum battery life. The use of batteries other than NiCads will result in leakage and or explosion resulting in damage to the unit.




LEFT SIDE VIEW RIGHT SIDE VIEW

**Flowmate III (Model # 2500LTE)**

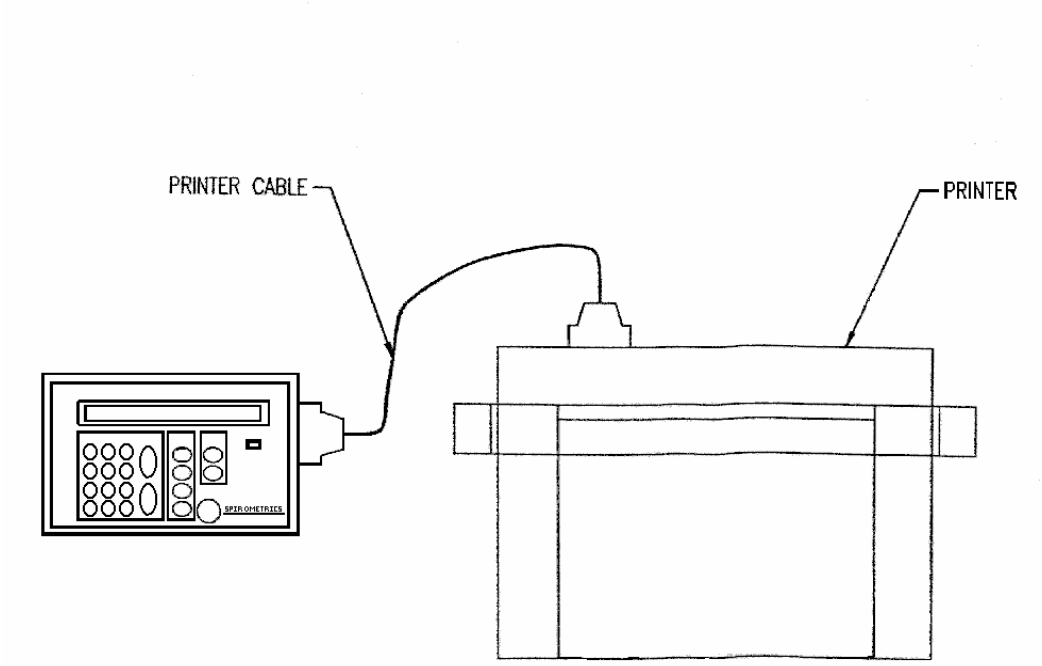
**Printer Installation-**

The Flowmate III provides a parallel output so that you can connect a variety of parallel printers. Connect your printer by attaching the standard parallel cable from the parallel output on the right side of the Flowmate III. Refer to the *printer's owner's manual* for information on compatibility and operation. The printer, when properly connected, prints after each test if you select the automatic test printout option. (You may select this in Customization p.18).

**NOTE:** You will probably need to select the spirometers' customization to match the printer you are using. If your printer is not named in the Customization Routine (p.18), refer to the printer manual. Most printers can emulate two or more types of printers. Configure your printer to match one within the Flowmate III's customization routine.

**Printer Requirements-** External parallel printer compatible with MS-DOS® with an emulation configurable to one of the following:

- EPSON FX
- EPSON LQ
- IBM Proprinter
- IBM Proprinter X24
- HP Laser / DeskJet



**Customization-**

Your Flowmate III spirometer comes pre-set with the standard configuration. You should, however, go through the customization routine (See Customization Routine p. 18) to customize operation according to your preferences and needs.

## STANDARD CONFIGURATION CHART

| Function | Standard Configuration | Options |
|---|---|---|
| | | |
| 1. Short Form/ Expanded Form | Short | Expanded |
| 2. Interpretation | Yes | No |
| 3. Normals | Composite | Knudson, Crapo, Morris, Hsu, ECCS, Lam or Industrial Version with Knudson, Crapo, Morris, Hsu, ECCS, Knudson76 |
| 4. Automatic Test Printout | No | Yes |
| 5. Patient Weight | Yes | No |
| 6. Weight in Lbs or Kgs | Lbs | Kgs |
| 7. Location I.D. # | No | Yes |
| 8. Re-enter Location I.D.# (each time Flowmate III is turned on.) | No | Yes (16 digits) |
| 9. Avg. Ambient Air Temperature | 72 F | 50-104F or 10-40C |
| 10. Avg. Barometric Pressure | 760mm Hg | 20-35in., 500 - 900mm |
| 11. Printer Type | IBM Pro | Epson LQ, Epson FX IBM Pro, IBM Pro-X24 HP Laser / DeskJet |

**STANDARD CONFIGURATION CHART** (Cont.)

| Function | Standard Configuration | Options |
|---|---|---|
| 12. Print Volume Time Curves | Yes | No |
| 13. Print Flow Volume Loops on Summary | Yes | No |
| 14. Print Best Test Curves | Both | VT Curve, FV Loop, None |
| 15. Print COPD Risk | Yes | No |
| 16. Print Lung Age | Yes | No |
| 17. Inhalation Defaults | Yes = Default is 5 breaths of inhalation? | NO = Enter how many breaths per concentration?<br><br>What is methacholine concentration?<br>(#2) = .025mg<br>(#3) = .250<br>(#4) = 2.500<br>(#5) = 10.00<br>(#6) = 25.00<br><br>What is the lower limit of normal?<br>Default = 08<br>Enter cum dose in mg/ml. |
| 18. Print Customization Settings | No default setting | Select Yes or No to print customization settings |

Once you have customized your spirometer, the settings will be retained in memory (protected by battery back-up) even after the unit is turned off. Consider printing out your customization settings for future reference.

## CUSTOMIZATION ROUTINE

Each question prompts you to choose a setting, and shows you the current setting for that item. If you simply press the ENTER key without entering a number first, the current setting remains. The Flowmate III then displays the next choice. If you want to change only one item, you can quickly scan through the routine. Press the ENTER key repeatedly until you get to the item you want to change. Press the PATIENT key after you enter the change to exit from the customizing routine to the Main MENU. All other settings will remain unchanged.

**NOTE:** All customization changes are saved and protected in NV RAM, which has a Super Cap (battery equivalent) back-up. When you turn your spirometer on, it will use your customization settings from your previous use - unless you choose to change them.

**To Start:**

Turn the Flowmate III on by pressing the POWER switch, located on the left side of the unit. Power on indicator will be green signaling a full charge and power on.

Check the date and time shown on the display. If they are incorrect, See Setting the Time and Date pg. 23.

⇨

```
Flowmate III version 2.6a
04/06/99 09:30  Spirometrics
Copyright  1999
```

Press **ANY KEY** or wait 5 seconds (this will bring you to the MAIN MENU).

⇨

```
MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)
```

Press ❷ for Customization Routine
(Customization Routine)
Press ❶ **or** ❷

⇨

```
Select desired format:  Now 1
(1=short form, 2=expanded form)
```

Press **ENTER**

❶ = short form

❷ = expanded form

See pg. 59 for indices reported in short and expanded forms respectively.

Press ❶ **or** ❷

Press **ENTER**

⇨ Diagnostic Interpretations? Now 1 (1=YES, 2=NO)

Simple interpretation message of test data. This prints at the end of the Best Test Summary Report. Interpretation Scheme described on pg. 50.

Select Desired Normals
Press ❶,❷,❸,❹,❺or ❻
Press **ENTER**
See pg. 59 - 62 for description of Normals.

⇨ Which Normals? Now 1
1=Composite
2=Knudson
3=Crapo
4=Morris
5=Hsu
6=ECCS
7=Lam or optional Knudson 76

Press ❶ or ❷
Press **ENTER**

⇨ Automatic Test Printout? Now 2 (1=YES, 2=NO)

**YES**= prints test report Immediately after patient effort.
**NO**= Must press PRINT to print reports.

Press ❶or ❷
Press **ENTER**

⇨ Do you want to record patient weight? Now 1 (1=YES, 2=NO)

**NOTE:** Weight is not used in any of the Normals tables. It is unnecessary in calculating test results.

Press ❶ or ❷
Press **ENTER**

⇨ Will weight be entered in LBS or KGS? (1=LBS, 2=KGS) Now 1

Question will not be asked if you choose NOT to record weight.

Press ❶ or ❷
Press **ENTER**

⇨ Do you use a Location ID number? (1=YES, 2=NO) Now 2

You may want a Location ID if you test in a variety of locations and move the spirometer from site to site.

If you answered ❶ to the above question the Flowmate III will ask the following **two questions:**

**Enter Location ID Number**

Press **ENTER**
(up to 16 digits including (/) and (.))

⇨ Enter the location ID number:
(up to 16 digits) Now 000

Press ❶ or ❷
Press **ENTER**
**YES** = The spirometer will immediately ask for the location ID each time the power is turned on.

**NO** = You will have to enter the customizing routine to re-enter the location ID each time you change locations.

⇨ Do you want to re-enter the Location ID each time you power-up? (1=YES, 2=NO) Now 2

**Enter Temperature**
Press **ENTER**

(Average Ambient air temperature where the spirometer is being used.) This value affects BTPS correction pg. 63.

⇨ Enter the Average Air Temperature:(50F-104F, 10C-40C) Now 72º F.

**Enter Barometric Pressure**
Press **ENTER**

(in inches or millimeters of mercury (Hg)). The Flowmate III automatically determines inches or centimeters when a number is entered.

⇨ Enter the Average Barometric Pressure:
(20-35 in, 500-900 mm)
Now 760 mm Hg.

**NOTE:** It is important to enter the average barometric pressure based on the elevation of your location, otherwise there will be an error in the BTPS correction.

Press ❶,❷,❸,❹ or ❺
Press **ENTER**

⇨ Which printer?
1=Epson FX
2=Epson LQ
3=IBM Pro
4=IBM Pro-X24
5=HP Laser/ DeskJet

Press ❶ or ❷
Press **ENTER**

⇨ Do you want to print Volume/Time Curves? (1=YES, 2=NO) Now 1

Volume/Time Curve is included when printing report for individual FVC tests.

Press ❶ or ❷
Press **ENTER**

⇨ Do you want to print Flow/Volume Loops? (1=YES, 2=NO) Now 1

Flow/Volume Loop is included when printing report for individual FV tests.

Press ❶,❷,❸or❹
Press **ENTER**

⇨ Graph Best Test Curve(s) on Summary?

1=Both

2=VT Curve

3=FV Loop

4=None

Includes chosen Best Test Curves on the Summary Report when printed.

Press ❶ or ❷
Press **ENTER**

⇨ Do you want to print COPD Risk? (1=YES, 2=NO) Now 1

COPD Risk (Chronic Obstructive Pulmonary Disease) assessment to be printed on the Summary Report.

Press ❶ or ❷
Press **ENTER**

⇨ Do you want to print Lung Age? (1=YES, 2=NO) Now 1

Lung Age calculation to be printed on the Summary Report.

Press **YES** or **NO**

⇨ Inhalation Challenge defaults okay? (Press YES or NO)

**YES** = See default settings pgs. 16 & 17.
**NO** = May change the methacholine default values for each dosage.

**If you answered NO to the prior question** the Flowmate III will ask the following questions: (Answer each question accordingly and then press **ENTER.** See Methacholine Challenge pg. 38.)

- How many breaths per concentration? (enter number of inhalations) Now 5
- What is methacholine concentration #2 ? (enter dose in mg /ml/ breath) 00.025
- What is methacholine concentration #3 ? (enter dose in mg /ml/ breath) 00.250

- What is methacholine concentration #4 ?
  (enter dose in mg/ ml/ breath) 02.500
- What is methacholine concentration #5 ?
  (enter dose in mg/ ml/ breath? 10.000
- What is methacholine concentration #6?
  (enter dose in mg/ ml/ breath) 25.000
- What is the lower limit of normal?
  (enter cum dose in mg/ ml) 8

Press **YES** or **NO**

**YES** = Printout of customization settings you have just made if printer is connected.

⇨

Would you like a printout of the settings you've just made? (YES or NO)

**NOTE:** Settings will be retained in memory when the spirometer is turned off. Spirometrics recommends that you printout a copy of your customization settings and retain for future reference.

## SETTING THE TIME AND DATE

This routine sets the internal time/date, which are printed on reports.

Press **PATIENT**
(this will bring you to the Main Menu)

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

Press ❹

Enter the **Correct Time**
(by entering four digits)

Press **ENTER**

⇨

What time is it: 12:01 (enter time, or press ENTER if correct)

Press **YES or NO**

The Flowmate III does not ask the question listed above if a 24 hour time is used.

⇨

What time is it: 12:01 Is that PM? (Press YES or NO)

Enter the correct time scale.
Press **ENTER**
12= American or 12 hour format
24= European or 24 hour format

⇨

Do you want time to be printed in 12 or 24 hour scale?
NOW 12

Press ❶ or ❷
Press **ENTER**

❶ =month/day/year (American)
❷ =day/month/year (European)

⇨

Print American or European date format? ( 1=mm/dd/yy ;
2 =dd/mm/yy): Now 1

Enter **Correct Date**
Press **ENTER**
Do not use the / when entering the date.

⇨

Set the date: Now 01/15/94
(in American format; slashes not needed)

Confirms time and date entered.

⇨

Time is: 12:01 PM
(12 hour scale)
Date is: 01/01/94
(American format)

The Flowmate III will automatically bring you back to the Main **MENU.**

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

## CALIBRATION

Calibrating your Flowmate III ensures accurate test results. Calibrate your spirometer before you use it for the first time. Re-calibrate your spirometer at routine intervals. Spirometrics recommends daily calibrations to assure that the spirometer is calibrated and working properly.

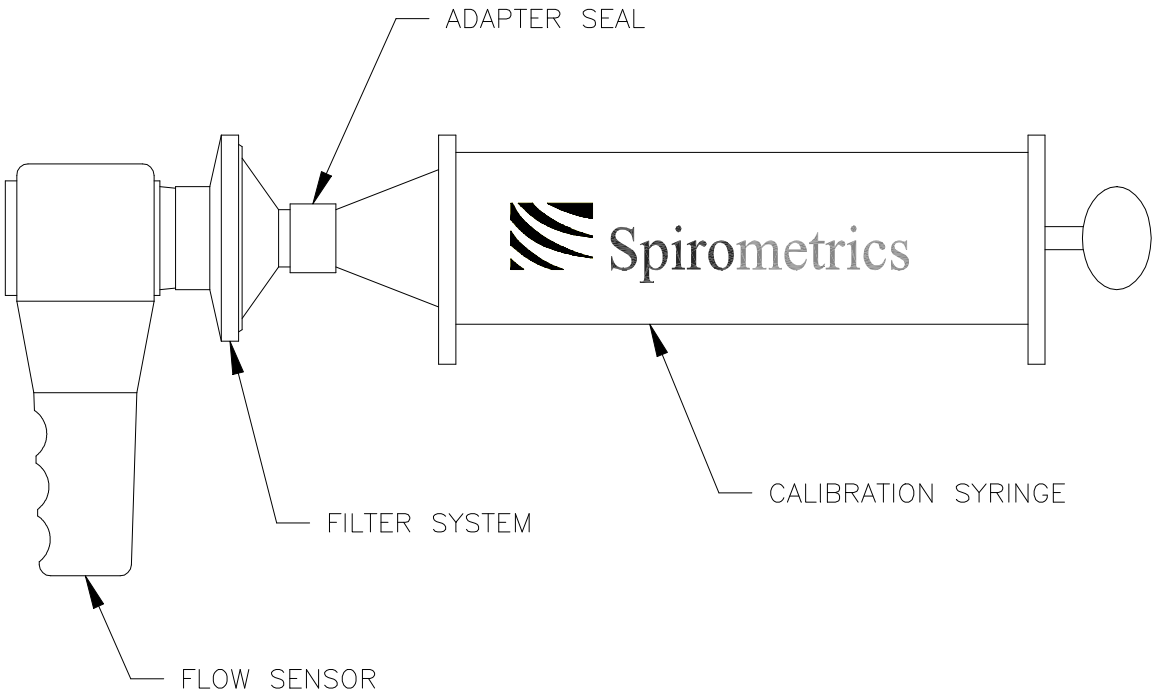
1. To perform a calibration, a calibration syringe and a calibration syringe adapter seal will be needed. (See pg. 75 for Flowmate III accessories).

2. Connect the adapter seal to the end of the calibration syringe. (See pg. 75 for Flowmate III accessories).

3. Connect the Flow Sensor Mouthpiece firmly to the calibration syringe.

NOTES

**NOTE:** In keeping with the American Thoracic Society's 1994 Standardization of Spirometry and good quality control procedures, it is recommended that the linearity of the flow sensing pneumotach should be checked on a weekly basis. This can quickly and easily be accomplished by injecting your calibration syringe at three different flow rates during a Follow-up Injection. As an example, taking a three liter syringe and injecting it 1, 3, and 6 seconds would create flow rates of 3 l/s, 1 l/s, and 0.5 l/s respectively. Answer YES to the question "Do You Want To Check Calibration Again?", and repeat for each subsequent follow-up injection desired to check. The volumes measured at the flow rates used, should all be within the stated +/- tolerance to be considered acceptable.



Press **PATIENT**
(This will bring you to the Main MENU.)

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

Press ❸

Enter correct syringe volume- i.e., 3 liters
Press **ENTER**

(Flowmate III will prompt you to inject the volume of air from the syringe.)

⇨

What is the test syringe volume? Now - (ENTER volume: 1-9 liters)

Press **ENTER**

⇨

MEDIUM rate injection -
about 1.5 sec.
(Press ENTER when ready - then inject)

**Inject syringe.**
Keep the calibration puck in the boundaries of the target range.

⇨

Too Slow [---OKAY---] too fast

Injection is acceptable.
**Inject syringe.**

⇨

Injection OK
Now inject syringe to check calibration

If injection is **not** acceptable, the following message will appear.

⇨

Injection too slow. Please retry.

**OR**

Injection too fast. Please retry

**Injection is OK**. A calibration report will print automatically if printer is connected.

⇨

Injected volume = 3.00 L; Reading OK

Press **YES or NO.**

**YES** =Inject syringe again to check calibration at different flow rates.

**NO** = Will automatically display the Main MENU.

⇨

Review the calibration report. Do you want to check calibration again?

**NOTE:** If calibration check message does not confirm the calibration setting, ("Calibration O.K.") clean the flow sensor.

## ENTERING PATIENT DATA

If needed, turn the Flowmate III on by pressing the POWER switch on the left side of the spirometer.

**NOTE:** When the Flowmate III is plugged into the AC adapter, The POWER switch indicator will be green. To check for a full charge, remove the AC adapter and turn the spirometer on. If the POWER light remains green the batteries are fully charged.

Check the date and time shown on the display.
(01/15/94 09:30)
If they are incorrect, See setting the Time and Date on pg. 23. or press **PATIENT**.

⇨

Flowmate III version 2.6a
Spirometrics, Copyright 1999

Press ❶

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

Enter Patient ID number,
Up to 16 digits- periods (.) and slashes (/) are acceptable. The ID number can be the patient's social security number or any other appropriate identification number. Each patient must have a different ID number. Do not start with a period.

⇨

What is patient's ID number?
(or press TEST)

**NOTE:** You can use the Test key to jump directly to the Test Selection question without having to first enter patient data. If you do this, the Flowmate III will display and print the test results. However, the results **will not include** predicted, percent of predicted, or interpretations, since there is no patient data on which to base the predicted. Also, the patient's test results **will not be stored** when you enter a new patient. The PATIENT DATA REPORT will be marked with the fictitious name of "John Doe -01, 02"... etc.

Press **YES** or **NO**

⇨

Is this Post-BD? If already Pre-BD test, and no Post-BD test yet.

**Enter Patient's Age.**
(up to 3 digits).
Press **ENTER**

⇨

What is the patient's age?
Enter the age in years. (27yrs)

**Select patient's sex.**
Press **ENTER**

⇨

What is the patient's sex
(1=male; 2=female)

**Select the patient's race**.
Press ❶,❷,or ❸
Press **ENTER**

⇨

What is the patient's race?
Caucasian
1=Caucasian
2=Black
3=Non-Caucasian

**NOTE:** The predicted values for Black patients are 85% of those for Caucasian or "Non-Caucasian" patients (as per most popular Normals studies). Caucasian and non-Caucasian are calculated equally - and are used to denote different origin on the report. See the Normals Table pg. 59.

**Enter the patient's height.**
Press **ENTER**
(in inches or centimeters)
Conversion chart feet/in/cm
See pg. 65.

⇨

What is the patient's height?
72 (30-89 inches,
90-250 centimeters)

**Enter the patient's weight.**
Press **ENTER**
If the patient's weight is not desired on results - do not enter weight-Press **ENTER.**

⇨

What is the patient's weight?
165 lbs (optional, enter in Lbs)

See Customization pg. 18 to configure Flowmate III to accept kilograms or to configure the Flowmate III not to ask this question by recording weight.

**NOTE:** This question is optional since weight is not a parameter in test result evaluation. See Customization pg. 18.

**Enter number of cigarettes per day**.
Press **ENTER**

⇨

How many cigarettes are smoked per day? (0 - 60)

Press ❶,❷,❸or❹

⇨

Which TEST would you like?
1=FVC
2=MVV
3=VC
4=CHAL (or Output)

**NOTE:** If the wrong test selection is entered, press TEST key then re-select desired test. For example, you may have pressed 1 for an FVC test and you wish to select an MVV test.

**NOTE:** Following test selection (as seen above) the Flowmate III will automatically enter the testing mode.

**NOTE:** If you breathe without selecting a test type, then FVC test is assumed and the testing mode is entered.

**Editing Patient Data-**

Press **PATIENT -** this will bring you to the Main MENU.

Press ❶ to review and/or edit patient entries. The entry routine will begin again, showing the data that was entered. Scroll through entries by pressing **YES** for correct entries and changing incorrect data.

Press **ENTER** when data is correct.

# PATIENT PREPARATION

**Explain**

...A spirometer is used to assess lung function. The purpose of the Spirometry test to you (the patient): is to measure how hard and how fast you can breathe and how much air is in your lungs. If properly performed the test results can indicate the presence or absence of an obstructive or restrictive lung disorder.

**Direct**

...the patient to:

- Remove or loosen tight clothing such as tight collars or necktie.
- Remove dentures (optional).
- Stand in front of the Spirometer. (Patient should not take the test sitting down unless he/she can not stand).
- Elevate chin and extend neck slightly.
- Use a nose clip, if available. (Have the patient pinch his/her nose if unavailable) see the Flowmate III Accessories pg. 75.

**Demonstrate**

...the procedure yourself:

- Take the deepest breath possible.
- Place mouth and teeth tightly around a mouthpiece.
- Do not block the opening with the tongue.
- Then, blow out as hard and fast and completely as possible- getting all the air out. If a loop is being tested, inhale deeply back through the sensor.
- Pull away from the mouthpiece.

**Instruct**

...the patient firmly and enthusiastically, "Take a good deep breath. Pull it ALL in. Push it all OUT!...Blow as hard as possible and then breathe it all back in... Good job!"

| **NOTE:** Testing may be affected if the patient: |
|---|
| • **Smoked** a cigarette or drank caffeinated **coffee** or tea within the last hour. |
| • Has used an **aerosol bronchodilator** within the last six hours. |
| • Has eaten a **heavy meal** within the past hour. |
| • Is acutely **ill** or has suffered from upper or lower respiratory problems within the past three weeks. |

## TESTING

Press **Patient**

⇨

| MENU: |
|---|
| 1=Patient |
| 2=Customization |
| 3=Calibration |
| 4=Time (or Output) |

Press ❶

⇨

| What is the patient's ID number? |
|---|
| (or press Test) |

**Enter patient ID Number.**
Press **ENTER**
Press enter repeatedly to scroll through patient data.

**NOTE:** If a NEW patient See Entering Patient Data (pg. 26); If retrieving a previous patient's test, scroll through patient data and change information as necessary.

Press ❶,❷,❸or❹

⇨

| Which test would you like? |
|---|
| 1=FVC |
| 2=MVV |
| 3=VC |
| 4=CHAL (or Output) |

.

**See the following test descriptions and operations:**

| | | |
|---|---|---|
| **1) FVC -** | **Forced Vital Capacity** | **Page 31** |
| **2) MVV -** | **Maximum Voluntary Ventilation** | **Page 33** |
| **3) VC-** | **Vital Capacity** | **Page 35** |
| **4) POST -** | **Bronchodilator Testing** | **Page 37** |
| **5) CHAL-** | **Methacholine Challenge** | **Page 38** |

## FVC Testing - Forced Vital Capacity Test

**FVC testing begins** after the patient data is entered. The Flowmate III will automatically be in testing mode.

⇨

| Which test would you like? |
|---|
| 1=FVC |
| 2=VC |
| 3=MVV |
| 4=CHAL (or Output) |
| |
| |

Insert a new filter for each patient.

Press ❶ ⇨

| Test No. 01 FVC |
|---|
| (Exhale hard! Then inhale.) |

**Instruct the Patient to:**

**1)** Place a noseclip on his/her nose.

**2)** Take as deep a breath as possible through the mouth and hold it.

**3)** Put the flow sensor mouthpiece in mouth- past teeth and form a tight seal. Make sure the tongue is not blocking the mouthpiece.

**4)** Blast ALL the air out as hard and fast as possible.

**5)** Inhale as deeply and quickly as possible through the mouthpiece.

**6)** Remove the mouthpiece.

**NOTE:** Flowmate III numbers each test consecutively, 01, 02,03...regardless of test type. This lets you recall the test later. See Retrieving-Test Results p. 41.

The Flowmate III shows an incentive bar graph of expiratory volume as the patient breathes into the mouthpiece. The screen incentive will continue to encourage the patient until the unit senses no more airflow.
*** = Target**

⇨

| 1 2 3 4 5 6 7 8 9 Lit |
|---|
| ÛÛ Û Û Û Û Û Û * |

Press **YES** or **NO.**
Once the patient has performed an FVC effort the technician must determine if the effort is acceptable.

⇨

| Was the patient effort acceptable? |
|---|
| (Press YES or NO) |

Answering **YES**
The Flowmate III computes, displays and stores the test results, of the patient's effort, and prints report if "autoprint" is customized.

⇨ Calculating test results...

Answering **NO**
The Flowmate III will abandon the test and the patient must try effort again.

**NOTE:** Patient effort is acceptable if the patient:

- Started with the deepest possible inspiration.
- Exhaled maximally with a good, fast start.
- Inhaled maximally after the expiration.
- Inhaled and exhaled smoothly. No coughing!

**NOTE:** The spirometer may display a message indicating that the test trial was too short, or that the start was too slow. Note that even if you see one of these messages, the unit will still accept and store the test in memory. (If test is under 1 second it is not accepted and another effort must be made.)

**Flowmate III displays results**
when a patient test is accepted.

⇨

| Index | Unit | Meas | Pred | % Pred | %Var |
|---|---|---|---|---|---|
| FVC | L | x.xx | x.xx | xxx | x.xx |

Press **TEST** or just breathe to start another test.

**NOTE:** The patient should perform three valid tests:

- Three tests should be reproducible within 5%.
- The patient must put forth maximal effort, both inhaling and exhaling.

## MVV Testing - Maximum Voluntary Ventilation Test

Entering Testing Mode...

**MVV testing begins** after the patient data is entered. The Flowmate III will automatically be in testing mode.

⇨

| Which test would you like? |
|---|
| 1=FVC |
| 2=MVV |
| 3=VC |
| 4=CHAL (or Output) |

Insert a new filter for each patient.

Press ❷
**(**See below to instruct the patient).

⇨

| Begin MVV RUNNING START. When effort is good, press ENTER to begin test. |
|---|

**Instruct the Patient...**

**1)** Place a noseclip on his/her nose.

**2)** Position mouthpiece in mouth past teeth and form a tight seal with lips. Make sure the tongue is not blocking the mouthpiece.

**3)** Breathe through the mouthpiece as rapidly and deeply as possible - like a strenuous exercise.

**4)** Press **ENTER** when the patient is breathing deep and regular. The patient should continue to breathe for 12 seconds.

**Patient Incentive Screen**

⇨

| -L/S 3 2 1 0 1 2 3 +L/S |
|---|
| ÛÛ Û Û Û Û Û Û * |

**Instruct the Patient...**

**1)** To look at the display while trying to make the bar move to the right and to the left as quickly and as far as he/she can.

**2)** As the patient breathes, the Flowmate III shows the incentive display of inspiratory and expiratory volume. The bar moves right on an exhale and left on an inhale. This display indicates the breathing pattern.

**3)** Remove the mouthpiece after 12 seconds have passed.

Press **YES or NO**.
Once the patient has performed an MVV effort the technician must determine if the effort is acceptable.

⇨

| Was the patient's effort acceptable? |
|---|
| (Press YES or NO) |

Answering **YES**
The Flowmate III computes, displays and stores the test results of the patient's effort, and prints report if "autoprint" has been chosen in customization.

⇨ Calculating test results.

Answering **NO**
The Flowmate III will abandon the test and the patient must try effort again.

**NOTE:** Patient effort is acceptable if the patient:

- Made a maximum effort.
- Lasted a full 12 seconds.
- Did NOT cough.

**Flowmate III displays results** when patient test is accepted.

| Index | Unt | Meas | Pred | %Pred | %Var | Mvv |
|---|---|---|---|---|---|---|
| L | | x.xx | x.xx | xxx | xxx | xx.x x.x |

Press **TEST** to start another test.

**NOTE:** The MVV test is an exhausting test. It should not be repeated without a rest period. Some elderly or ill people cannot repeat this test, even after a rest period.

## VC Testing - Vital Capacity Test

Entering Testing Mode...

**VC testing begins** after the patient data is entered. The Flowmate III will automatically be in testing mode.

⇨

```
Which test would you like?
1=FVC
2=MVV
3=VC
4=CHAL  (or Output)
```

Insert a new filter for each patient.

Press ❸

⇨

```
Test No. 1 VC
(Exhale slowly...)
```

**Instruct the Patient...**

**1)** Place a noseclip on his/her nose.

**2)** Take as deep a breath as possible through the mouthpiece and hold it.

**3)** To place mouthpiece in mouth past teeth and form a tight seal with lips. Make sure the tongue is not blocking the mouthpiece.

**4)** Exhale slowly...push EVERY bit of air out.

**5)** Remove the mouthpiece.

**Patient Incentive Display**

```
1  2  3  4  5  6  7  8  9  Lit
ÛÛ Û Û Û Û Û Û        *
```

**Instruct the Patient...**
...to look at the incentive display. Try to make the bar move to the right as far as possible.

Press **YES** or **NO**
Once the patient has performed a VC effort the technician must determine if the effort is acceptable.

⇨

| Was the patient effort acceptable? |
|---|
| Press YES or NO |

Answering **YES**
The Flowmate III computes, displays and stores the test results of the patient's effort, and prints report if "autoprint" has been chosen in customization.

Answering **NO**
The Flowmate III will abandon the test and the patient must try effort again.

| **NOTE:** Patient effort is acceptable if the patient: |
|---|
| • Made a maximum effort. |
| • Exhaled completely. |
| • Exhaled smoothly-NO coughing. |

**Flowmate III displays results** when patient effort is acceptable.

| Index | Unit | Meas | Pred | % Pred | %Var |
|---|---|---|---|---|---|
| VC | L | xx.x | xx.x | xxx | xx.x |

## Post - Bronchodilator Testing

After giving the patient a series of baseline tests, you may want to administer a bronchodilator and then retest the patient to measure the effect of the bronchodilator. The Flowmate III calculates the differences in various Pre-BD and Post-BD indices. (BD= Bronchodilator)

**Post-Bronchodilator Testing** begins after the patient data is entered. The Flowmate III will automatically be in testing mode.

Press **Patient**
Press ❶

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

**Re-Enter the patient's ID number.**
Press **ENTER**

⇨

What is the patients ID # ?
(or press test)

Press **YES** = for Post-BD testing. This confirms that the tests which follow will be Post-BD.
Press **NO** = If you wanted to continue Pre-BD testing on this patient.

⇨

Is this Post-BD?

Press **ENTER** repeatedly to scroll through patient data until you have reached the test options. Make sure patient data is correct. If not, correct data.

⇨

Which test would you like?
1=FVC
2=MVV
3=VC
4=CHAL (or Output)

**Press desired test**
Press ❶,❷,❸
(i.e., 3 was chosen here.)

⇨

Test No. 3 VC-Post - Bronchodilator
(Exhale slowly...)

**Continue testing as usual.** Post-BD testing and Pre-BD testing are performed in exactly the same manner. The only difference is that the test reports label the "Pre-BD" and the "Post-BD" results on the Best Test Summary Report.

**NOTE:** In order to do Post-BD testing on a patient, the Flowmate III must have the patient's Pre-BD tests stored in memory. Only five patients can be stored in memory at the same time. Therefore, you must be careful not to accidentally erase the Pre-BD data by testing a sixth patient before the first has had Post-BD tests. See Retrieving Test Results (pg. 41).

EXCEPTION: If a memory card is used you can store 118 patients.

## Methacholine Challenge

The methacholine challenge test is a means of determining airways reactivation. It is useful for diagnosing "variant asthma" and to identify predictive factors in asthma patients.

- Variant asthma: This is an intermittent asthma, which may occur with exercises, cold air, infections, or at night. The patient's baseline spirometry might appear normal, and there isn't a significant response to a bronchodilator, hence they appear non-asthmatic. A methacholine challenge test will demonstrate an abnormally high airways reactivation in patients with variant asthma.
- Predictive Factors: The degree of airways reactivation may be correlated with the severity of asthma symptoms and the duration or frequency of asthma attacks.

The methacholine challenge test is performed by inhaling successively increasing doses of methacholine, and measuring the change in FEV1 between each dose. Only the FEV1 is important in this test.

Press **PATIENT**

(This will bring you to the Main MENU).

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

Press ❶

⇨

What is the patient's ID number? (or press TEST)

Press ENTER repeatedly to scroll through patient data until you reach the test selection question.

**Methacholine Challenge testing begins** after the patient data is entered. The Flowmate III will automatically be in testing mode.

⇨

Which test would you like?
1=FVC
2=MVV
3=VC
4=CHAL (or Output)

Insert a new filter for each patient.

Press ❹

⇨

**Administer 5 breaths of diluent.** (press ENTER when ready for FVC test)

**NOTE:** Diluent is a saline solution with no methacholine in it. It is a placebo, which will give a baseline spirometry reading. Once the diluent has been administered, and the ENTER key pressed, the normal FVC routine is entered. The FVC test is conducted as usual and all FVC and FEV1 indicies are the same as the normal FVC testing (with the exception of the test header).

**Instruct the Patient...** (SEE FVC TESTING SECTION pg. 31)

**1)** Place a noseclip on his/her nose.

**2)** Position the flow sensor mouthpiece in mouth- past teeth and form a tight seal. Make sure the tongue is not blocking the mouthpiece.

**3)** Take as deep a breath as possible through the mouthpiece and hold it.

**4)** Blast ALL the air out as hard and fast as possible.

**5)** Inhale as deeply and quickly as possible through the mouthpiece.

**6)** Remove the mouthpiece.

Press **TEST**
Each time you would like to start a new test. The Flowmate III will ask if you would like to increase the challenge dose.

⇨

Do you want to increase the challenge dose? (YES, NO, or exhale for another FVC)

**NOTE:** Several baseline FVC tests should be performed until the %Var is less than 5%. You (the technician/physician) must determine whether to repeat another baseline test or continue with the challenge. Also, whether to continue another FVC for that dose, or whether to increase dosage.

Press **ENTER**

The Flowmate III selects the best test as per the normal best test algorithm, and then checks to see if the FEV1 %Pred is less than 70%. It is not recommended to continue testing if results are less than 70%. The Flowmate III displays a flashing Warning message recommending that the challenge be stopped.

⇨

LOW FEV1; CHALLENGE NOT RECOMMENDED!!

Press CLEAR to stop;

ENTER for challenge test

**CLEAR =** The Flowmate III will revert back to the test selection prompt, but the baseline test is saved.

⇨

Which test would you like?
1=FVC

2=MVV

3=VC

4=CHAL (or Output)

If **ENTER** is pressed:
The methacholine test will continue.

⇨

| |
|---|
| Administer 5 breaths of xx.xx mg/ml -#n |
| Press ENTER when ready for FVC tests |

**NOTE:** In the display above, xx.xx is the dosage of methacholine in mg/ml corresponding to sequence number n, as set in the customization routine (pg. 18). The baseline test has a sequence number of 1. There are up to seven sequences.

**Once ENTER is pressed:**
The normal FVC test routine is performed, but the display and report for the challenge test are different. The index of primary interest is the FEV1. The display also has columns with BASE and %CHNG (for baseline readings).

⇨

| | | | | | |
|---|---|---|---|---|---|
| Index | Unt | Meas | Base | %Chng | %Var |
| FEV1 | L | x.xx | x.xx | x.xx | xxx |

**NOTE:** The **DISPLAY** key may be used as normal to scroll through the test indices. FVC tests should be continued for this dosage until the %Var is less than 5%. The only indices reported in the methacholine challenge tests are the FEV1 and FVC.

Press **TEST** to continue testing once the test results are displayed.

**Administer five breaths**
There are up to five sequences of methacholine (#2-6) and then one sequence (#7) of bronchodilator to open the airway back to normal. Perform the FVC maneuver. Continue to perform the FVC maneuver on the patient with the same dosage until the % Var is less than 5%.

⇨

| |
|---|
| Administer 5 breaths |
| of xx.xx #x |
| Press **ENTER** when ready for FVC test. |

**Administer Bronchodilator**
After a sequence of six tests has been performed or the patient's FEV 1 has dropped 20%, administer a bronchodilator to open the airway back to normal.
Press **ENTER** and perform another FVC test.

⇨

| |
|---|
| Administer Bronchodilator. |
| |
| Press **ENTER** to continue. |

**FEV 1 has Dropped**
If there is a 20% drop in the FEV1 from the base line, this will appear on the display.

⇨

| |
|---|
| FEV 1 has dropped xx%, challenge complete. |
| Press **ENTER** to continue. |

Press **YES** or **NO**
This question will appear if the test key is pressed after the bronchodilator sequence i.e., #1-#7.
YES = end of challenge

⇨

| |
|---|
| Do you want to end challenge? |
| (YES, NO, or exhale for another). |

## Patient Reports

**NOTE:** A patient report can be automatically printed after each spirometry effort is performed. See Customization pg. 18.

## Retrieving Test Results

**Retrieving**:

The Flowmate III stores each test in memory as the test is completed. You can recall this test data later for displaying, printing, or erasing. For example, you may want to erase a previous test, because it was poorly done, or you may want to refer to a pre-bronchodilator test while you are giving a post-bronchodilator test.

Each test for a given patient has two digit test numbers 01,02,03...This number increases by one for each consecutive test on the patient regardless of the test type, or whether the testing is in pre- or post- bronchodilator. The Flowmate III displays the test number just before the patient takes the selected test. The test number prints on each test report for all tests. The number of the best test also prints on the Best Test Summary Report. You can recall a test from memory by referring to its test number.

**To Recall a Test:**

Press **PATIENT**

⇨

MENU:
1=Patient
2=Customization
3=Calibration
4=Time (or Output)

Press ❶

⇨

What is the patient's ID number? (or press TEST):

**Input Patient ID Number**
Press **ENTER**
Press enter repeatedly until you reach the test selection question.

Which test would you like?
1=FVC
2=MVV
3=VC
4=CHAL (or Output)

Press **DISPLAY**

For which test would you like data? (enter number of test).

**Enter test number you would like to select.**

**NOTE:** If you are unable to remember the patient ID number you desire, you may return to the Main MENU (press PATIENT key). Press the SUMMARY key for a printout of the patient directory.

When a patient has finished a test and you have indicated that the patient's effort was acceptable, the spirometer automatically displays the results of the test.

You can use the **DISPLAY** and **PRINT** key to control the data as follows:

⇨

**DISPLAY KEY**

Press repeatedly to scroll through the various test indices. After the last index is displayed, the sequence will loop around to the first index. The indices appear in the same order they are printed on the test report.

## Printing Patient Reports

⇨

**PRINT KEY**
(printer must be connected)
**In Main MENU**
Press to **Batch print** the tests of all or some of the patients.

**In Testing Mode** Press to print a report of the current test. If you select "auto print" in the customization routine, the report automatically prints out at the completion of the test, just as if you pressed print.

## Erasing a Test

⇨

**ERASE KEY**

**In Main MENU**
Press to erase the tests of all or some of the patients.

**In Testing Mode** Press to erase the test data from a single patient. As a safety check, the Flowmate III will always ask you if you are sure you would like to erase data. Use the erase key if you have accepted a patient test, but after review decide to delete the data.

Press **ERASE**

**at the test selection question**

⇨

Which test would you like?
1=FVC
2=MVV
3=VC
4=CHAL (or Output)

Enter the number of the test that you want to erase

⇨

Which test would you like to erase? ( enter number of test)

Be sure you want to erase the test. Once you erase it, there is no recovery.

⇨

Are you sure you want to erase test NO. xx ? (press YES or NO)

## Summary Reports

⇨

**SUMMARY KEY**

Press to print a Best Test Summary Report of all the data in memory for that patient. If this is used during the Methacholine Challenge it gives only the Methacholine Challenge Summary.

The following are possible summary reports:

- Pre Testing
- Best Post BD Summary
- Inhalation Challenge

**Report Header**: Each test report has a header that gives the type of test, the number of the test (to recall test from memory), and the date and time of the test.

**Index:** This column indicates the names of the various test indices. Read across the line to receive values for an index.

**Unt: (unit)** Indicates that L= liters, L/M = liters per minute, and L/S = liters per second.

**Meas:** Indicates the actual measured value for that index, in the units indicated in the "UNT" column.

**Pred:** Indicates the predicted value for the index, based on the patient data (age, sex, height, and race). If you skipped the patient data entry routine, or the given patient is out of range for the selected predicted Normals table, then the Flowmate III prints a "N/A" (not applicable) in the appropriate columns.

**%Pred:** Compares the patient's measured result to the predicted normal result for that index, expressed as a percentage.
% Predicted = (Measured/Predicted) X 100%.

**%Var:** Indicates the variability or reproducibility of the test index, as compared to the best previous measured value for that index. This value must be less than 5% for the FVC and FEV1 indices in order for the FVC test to be regarded as reproducible. Continue testing until the % Var is less that 5% for these indices. The % Var is not critical for other indices, but it should be as low as possible.

**Diff:** Indicates the variability of test indices between Best Test Post effort to Best Test Pre effort. The comparison is in indices units of measure.

**%Diff:** Indicates the variability of test indices between Best Test Post effort to Best Test Pre effort. The comparison is expressed in % Difference.

**NOTE:** The variability (%VAR) does not appear on the first test taken since there are no indices in memory to compare it to.

## Test Storage Capacities

The Flowmate III patient storage memory will automatically store up to five patients. The patient storage memory will always discard the earliest patient once the Flowmate III reaches the maximum patient storage. Always print or erase patients in storage.

The optional memory card is only an extension of the system memory. It is only temporary storage for the patient tests until they are printed. The optional memory card will store an additional 118 patients. (See Accessories pg. 75).

## Memory Card

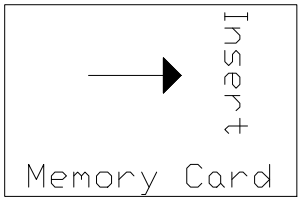
The Flowmate III has a number of optional accessories to aid in spirometry testing. The patient data memory card can be purchased separately for your Flowmate III. By adding the **optional** memory card approximately **118 patients** can be stored for future printing or processing.

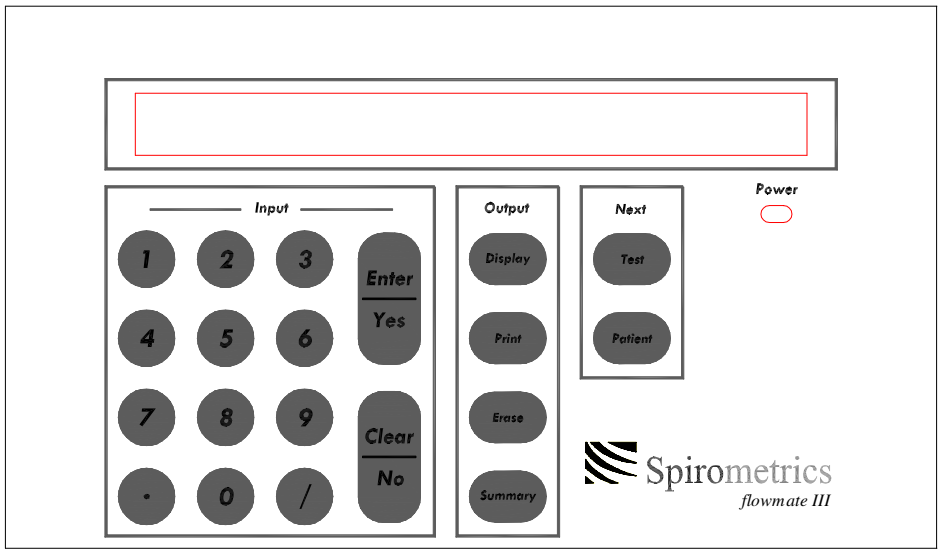
The memory card is an extension of your spirometers memory. When saving, retrieving, editing, printing or, erasing patient tests on the memory card, follow the instructions in the respective sections in this manual. The only difference when working with the memory card is that it must be installed in order to save patient tests and to work with this data.

**NOTE:** Please refer to the memory card reference (This will accompany the memory card or be printed directly on it).

**CAUTION:** Do NOT use memory card as permanent storage.

**CAUTION:** Do not remove or install memory card while the spirometer is turned on.



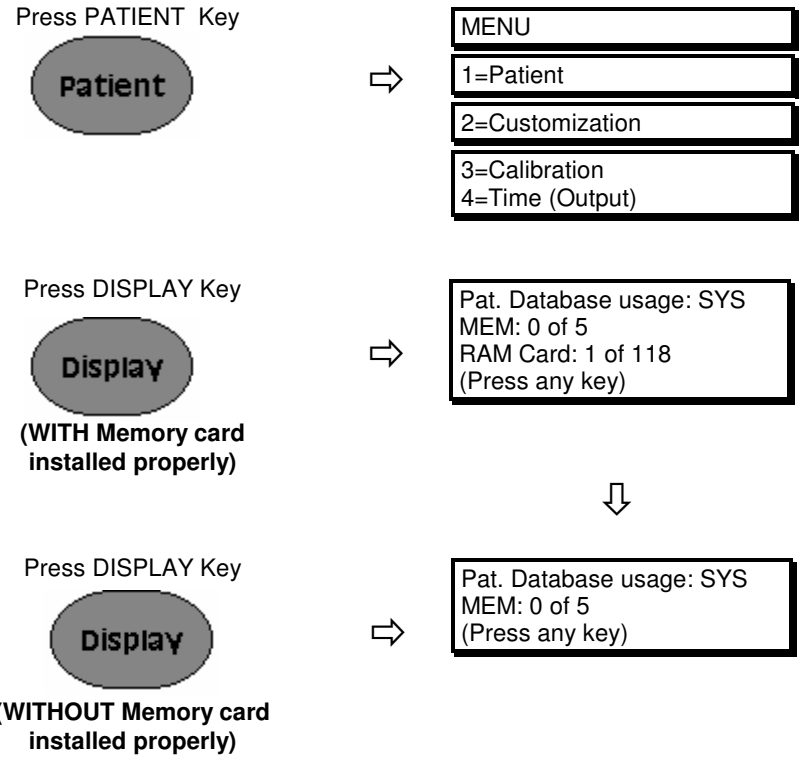
## Installing the Memory Card:

1) Make sure the spirometer is turned off.

2) Slide the memory card into the slot, making sure that the card is properly oriented as shown.

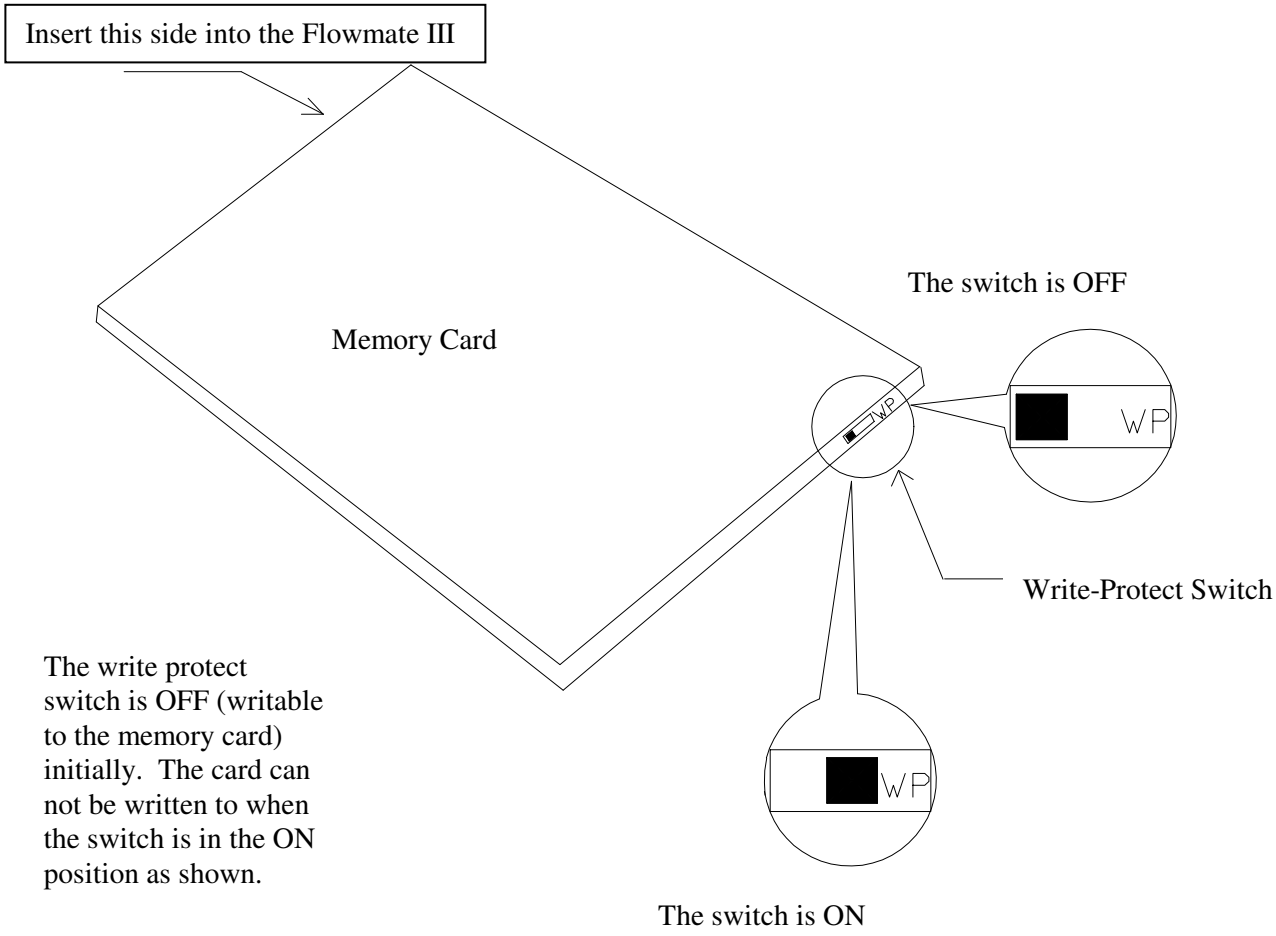
3) Gently push until the memory card seats into place and can go no further.

## Checking the Position of the Memory Card:



**NOTE:** For efficient management of memory, we recommend that patient tests be erased from the memory card after printout.

**NOTE:** There is a write-protect switch located on the memory card. The Flowmate III cannot communicate properly with the memory card when this switch is set to ON. The switch must be turned to OFF in order to store patient tests. Keep the write-protect switch set to OFF.


Insert this side into the Flowmate III
Memory Card
The switch is OFF
WP
Write-Protect Switch
The write protect switch is OFF (writable to the memory card) initially. The card can not be written to when the switch is in the ON position as shown.
WP
The switch is ON

## Saving Patient Tests on the Memory Card:

The Memory Card is an extension of your spirometers memory. Your spirometer unit memory has storage space to hold five patient tests. When you do Patient No. 6 the memory card will save Patient No. 1. The Memory Card stores the earliest patient in the unit memory. When the Memory Card is full, the Flowmate III will prompt the user:

## Printing Tests Using the Memory Card:

Press PATIENT Key

⇨

MENU
1=Patient
2=Customization
3=Calibration
4=Time (Output)

⇩

Press PRINT key

⇨

Batch Print all or some patients?
1=All
2=Some
3=None

❶ = Batch print tests of all patients in memory.

❷ = Print tests of selected patients - must enter patient ID numbers.

❸ = This will bring the user back to the Main MENU.

Once you have printed patient tests, you must press PATIENT to return to Main MENU.

**NOTE:** If you are unable to remember the patient ID number you desire, you may return to the Main MENU (press PATIENT key). Press the SUMMARY key for a printout of the patient directory.

## Erasing Saved Patient Tests on the Memory Card:

Patient tests that are saved on the Memory Card can be deleted as a group or one at a time.

⇨

Erase all of the Patient Database? (1=All, 2=RAM Card Only, 3=None)

## Interpretations

The Flowmate III can make simple diagnostic interpretations of the spirometric test data. The interpretation scheme is designed to distinguish normal from abnormal pulmonary function test results without making a diagnosis. All relevant data must be taken into account when making a valid diagnosis. Spirometry test data cannot stand by itself. When the Flowmate III interprets a patient's spirometric test results as abnormal, or suggests a disorder; the patient should be referred to a pulmonary specialist for further testing. It is important to coach patients to their maximal efforts.

**Warning:** Spirometry tests must be evaluated by a qualified physician. The interpretations printed by the Flowmate III are suggestive only, and not conclusive.

Press Summary to print a Best Test Summary Report. An interpretation of the test results will be printed at the end of the report. You can choose NOT to print the interpretations in the Customizing Routine (See pg. 18).

Interpretations are based entirely on two indices: FVC and FEV1. The Flowmate III uses the best of each of these indices. (See Specifications Pg. 73).

**Interpretations Table**

The following table gives the interpretation scheme and corresponding diagnostic messages:

| %PRED FVC | %PRED FEV1 | FEV1/FVC | INTERPRETIVE MESSAGE |
|---|---|---|---|
| | < 75% | ≤75% | LOW FEV1 Suggests Obstructive Disorder |
| | < 60% | ≥75% | LOW FEV1 Suggests Ventilatory Disorder |
| < 75% | | ≥75% | LOW FVC Suggests Restrictive Disorder |
| < 60% | | < 75% | LOW FVC Suggests Ventilatory Disorder |

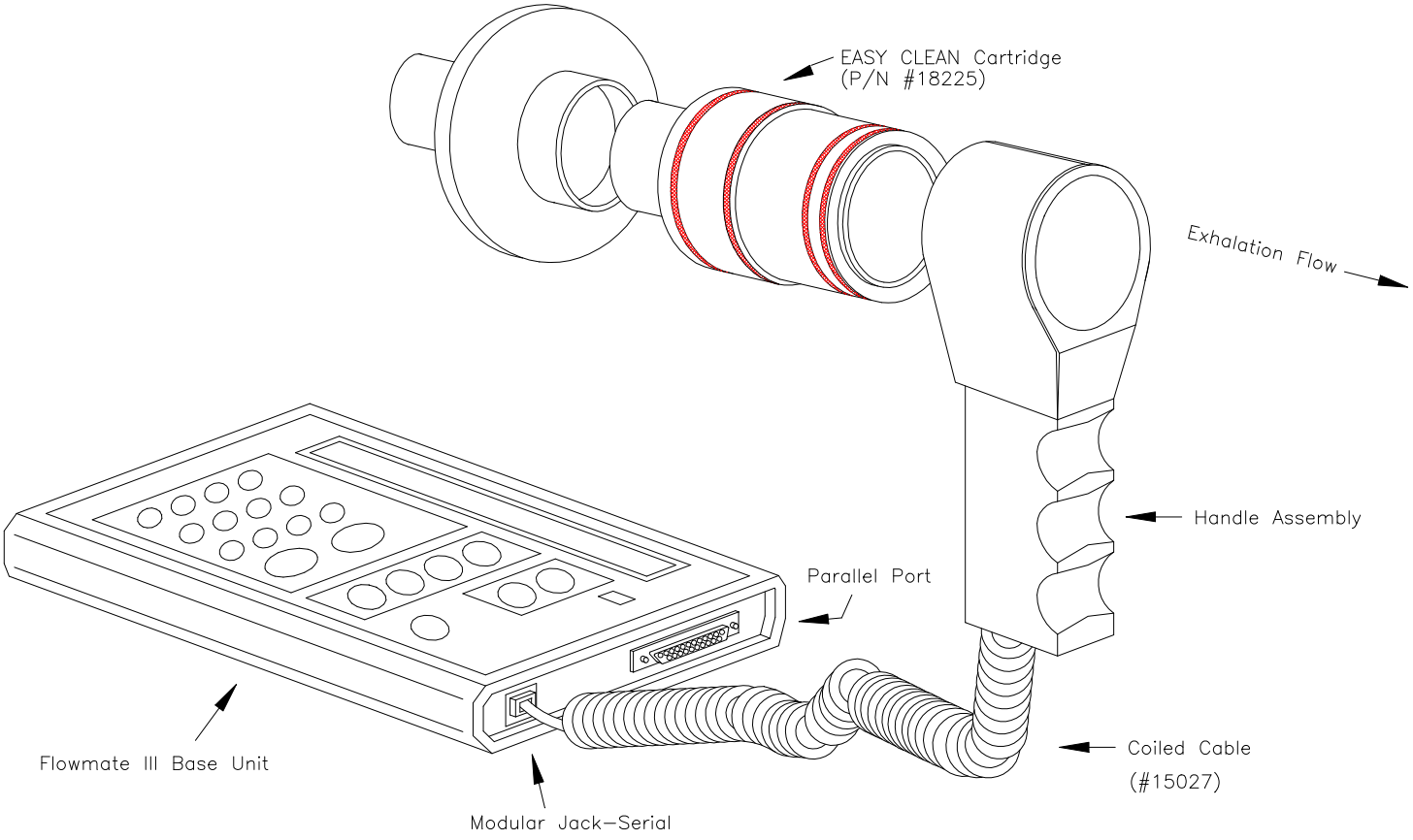
IN ALL OTHER CASES SPIROMETRICS RESULTS APPEAR NORMAL

# MAINTENANCE

## Cleaning the Flowmate III

The most important maintenance routine for the Flowmate III is cleaning the Flow Sensor. The outer surface of the Flowmate III needs no special cleaning.

| |
|---|
| **WARNING:** Spirometrics recommends wearing rubber gloves while cleaning to protect against cross-contamination. |



## Disassembling the Flowmate III Flow Sensor

You must disassemble the flow sensor to clean it. Refer to the figure below to learn the names of the different parts of the flow sensor.

**CAUTION:** Do not use alcohol on Flow Sensor or any other Flowmate III parts.

**WARNING:** To reduce the risk of cross contamination Spirometrics states that you replace the Filter Mouthpiece Housing between patients. The EASY CLEAN Cartridge's recommended cleaning schedule when the 2195 Filter Mouthpiece Housing is used, is monthly or every 60 patients, whichever comes first.

When testing a patient with an active communicable disease, the EASY CLEAN Cartridge should be cleaned before reuse even when the 2195 Filter Mouthpiece Housing is used. This is especially important after you test any patient with an active communicable disease.

**WARNING:** Always unplug the Flowmate III before cleaning to avoid electric shock.

### Disassembling the Flow Sensor:

1) Unscrew the EASY CLEAN Cartridge with a counter clockwise motion.

2) Continue to turn the EASY CLEAN Cartridge until the threads are dis-engaged from the handle assembly.

3) Pull Entire Easy Clean Cartridge when it is no longer engaged with the sensor core housing.

**CAUTION**: Please DO NOT disassemble the core element. The Easy Clean Cartridge can be cleaned fully assembled.

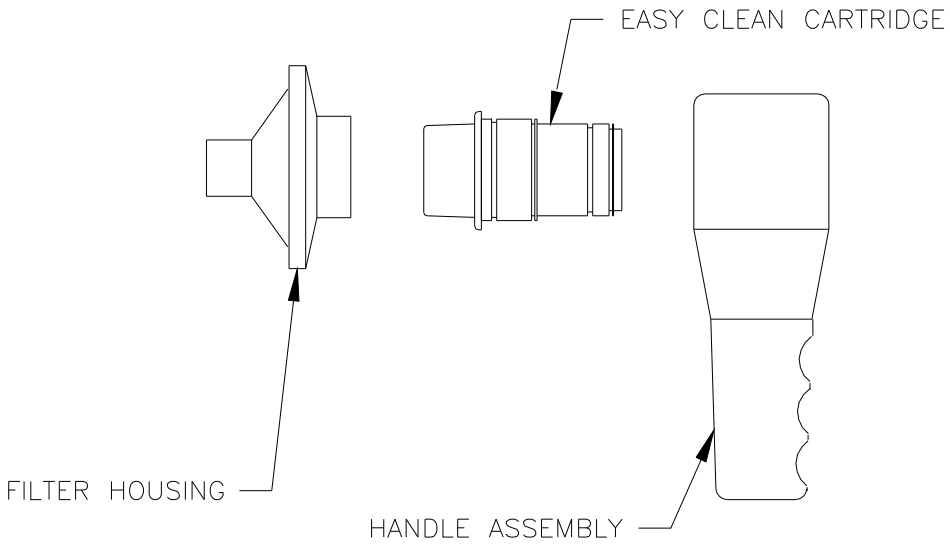
## CLEANING THE FLOW SENSOR:
### Core element:

1) Clean the core element in cold sterilization fluid (a protein dissolving solution). Follow the manufacturer's instruction for disinfecting and sterilizing.
2) Be sure to rinse in water thoroughly and allow to dry completely before attempting to re-insert the Easy Clean Cartridge into the handle assembly.

## CLEANING AND SANITIZING:

In addition to regular cleaning of the flow sensor as described above, the remaining parts of the FLOWMATE III may become soiled and require occasional cleaning or sanitizing.

1) ALWAYS UNPLUG THE FLOWMATE III BEFORE CLEANING TO AVOID ELECTRICAL SHOCK.
2) The base unit and the handle assembly may be cleaned with a soft cloth dampened with water or a mild disinfectant soap. Squeeze all excess water from the cloth before wiping the unit. DO NOT allow any water to enter any opening on the unit.
3) External surfaces of the unit may be sanitized by gently wiping with a disposable germicidal cloth such as a Sani-Cloth®.
4) DO NOT use abrasives or harsh chemical solutions to clean the unit.
5) The FLOWMATE III is not waterproof or autoclavable.




To disassemble the Flow sensor unscrew the Core Element counterclockwise
To assemble the Flow Sensor screw in the Core Element clockwise

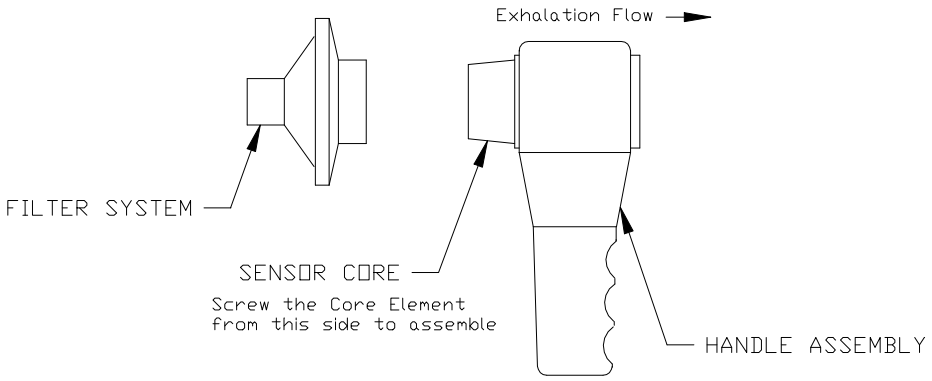
## Assembling the Flowmate III Flow Sensor

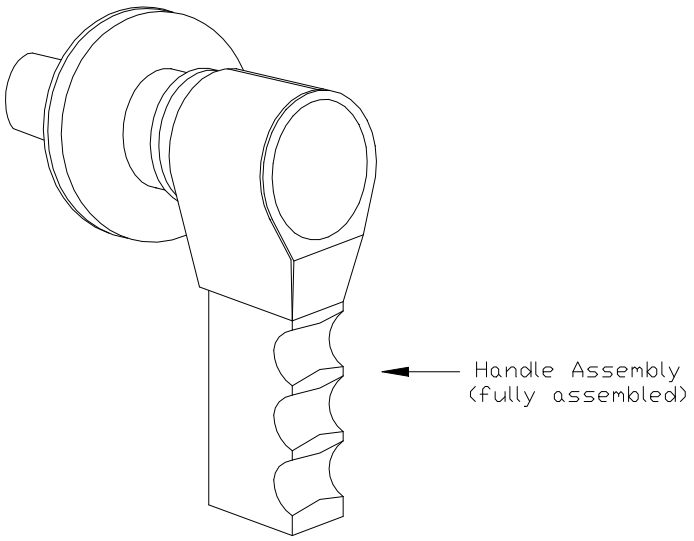
1) Insert the EASY CLEAN Cartridge back into the Sensor Assembly and turn clockwise to tighten.

2) Insert the back of the Easy Clean Cartridge into the handle assembly towards the finger grips.

3) Insert into sensor handle and turn clockwise to tighten. Once the EASY CLEAN Cartridge has contacted the inner core housing outer face, turn until snug (about a 1/32 of a turn or roughly a quarter [1/4] of an inch). Over tightening can damage the sensor handle alignment pins.

**WARNING:** Do not disassemble core element. The core element can be cleaned fully assembled.



# TROUBLESHOOTING

If your Flowmate III is not operating properly, try the following suggestions. If any problems persist or seem too complex to solve immediately, you can contact us at spiro@spirometrics.com or call us at 207-657-6700 or 800-767-0004.

**Power Related:**

This section contains solutions for solving possible power related problems such as:

- AC adapter
- Battery power
- Memory back-up.

| Problem | Solution |
|---|---|
| Spirometer unit will not power on when power switch is on. | • Check battery installation.<br>• Connect provided AC adapter to base unit. Plug into standard 120 volt 60hz outlet.<br>• Turn the POWER switch on.<br>• A green POWER light should be seen and the display screen will show text. |
| Spirometer unit will not power even with AC adapter. | • Check outlet.<br>• Be sure your outlet has power.<br>• Test your outlet by plugging in a working lamp. If the lamp lights, your outlet has power. If lamp does **not** light, have your circuit breaker checked.<br>• If your outlet works and your spirometer will not power-up, it is possible that your AC adapter is damaged.<br>• Contact your local distributor or Spirometrics. |
| Batteries will not hold a charge. | To completely charge your batteries plug your AC adapter into a standard wall outlet and allow the spirometer to charge for 15 hours before portable use. |
| Indicator light is RED and the spirometer beeps. | Batteries used to power the spirometer are low. Connect the base unit to provided AC adapter and continue use while adapter is connected. If the spirometer continues to display the RED indicator light or beeps, or fails to display, then check the DC output voltage of the wall transformer (should be between 9 – 12 volts). |
| Flowmate III will not hold the Time/Date or Customization. | A rechargeable Super Cap is used to retain Time/Date and Customization Settings. It is possible that the memory back-up voltage is low. The Super Cap is designed to be periodically recharged. This is accomplished by turning the unit on for 5 – 10 seconds every two to three weeks when the unit is not being used regularly. |

## Flow Sensor:

This section contains possible solutions for solving problems related to the Flow Sensor such as:

- Connection to base unit
- Cleaning
- Core Element Placement

| Possible Problem | Solution |
|---|---|
| The base unit does not recognize flow sensor. Message "Connect Sensor" is displayed. | Check the connection of the Flow Sensor to the base unit. Provided with your spirometer is a coiled retractable cable cord with modular plugs at both ends. Plug either end into the Flow Sensor, then the other into the base unit. Use only the cord provided with your spirometer. Use of other cords could cause damage to your spirometer. |

## Calibration:

This section contains possible solutions for calibration problems.

| Problem | Solution |
|---|---|
| When performing linearity check at different flow rates, the reported values exceed the +/- tolerances. | Check the Following...<br>• The proper reference value of the calibration syringe is entered. ie., 3Liter value for a 3Liter Calibration Syringe.<br>• The calibration syringe does not leak air.<br>• The adapter seal for air leakage- make sure it provides a tight seal around the syringe nozzle and the filter system.<br>• The filter system is snugly connected to Flow Sensor.<br>• The Easy Clean Cartridge snuggly screwed into the outer core housing.<br>• Is Core free from moisture buildup?<br>Perform calibration linearity check to verify that any changes have corrected the earlier problem. |
| The calibration graph will not move within the tolerance window of the calibration routine and the sensor will not detect flow. | Check that the core element is properly installed. This requires complete insertion of the core element into the handle assembly. Refer to the maintenance section for assembly instruction. |

| Problem | Solution |
|---|---|
| Can not keep the calibration puck within the tolerance window in the calibration routine. | Calibration of the Flow Sensor requires a steady even injection from the calibration syringes.<br>Check the Following...<br>• The proper reference value of the calibration syringe is entered. (ie., 3Liter value for a 3Liter Calibration Syringe.)<br>• The calibration syringe does not leak air.<br>• The adapter seal for air leakage- make sure it provides a tight seal around the syringe nozzle and the filter system.<br>• The cap on the assembled filter system is tight. |
| The calibration puck will not move within the tolerance window of the calibration routine and the sensor will not detect flow. | Check that the core element is properly installed. This requires complete insertion of the core element into the handle assembly. Refer to the maintenance section for assembly instruction (pg. 54). |

## Patient Storage:

This section contains possible solutions to patient storage problems.

| Problem | Solution |
|---|---|
| Flowmate III will not store more than 5 patients in the unit memory. | In order to store more than 5 patients you will require a memory card. Call your local distributor or Spirometrics Inside Sales Department.<br>You will need the following: minimum 1/2 Megabyte SRAM card with a battery; 68 pin PCMCIA 2.0 compatible. (See Accessories pg.75) |
| Flowmate III will not store more than 5 patients **with a memory card.** (A Memory Card will provide additional storage- this is separate from the unit memory.)<br><br>When the memory card is properly installed the display will read:<br><br>Pat. Database usage:SYS MEM: 0 of 5 RAM Card: 1 of 118<br>(Press any key) | Check that your Memory Card is properly installed into the Memory Card slot. The card will only be accepted into the slot when properly inserted.<br><br>Check to see if your card is properly installed: Press the DISPLAY key at the Main MENU to see if the Flowmate III recognizes the Memory Card. The second line on the display will state the status of the Memory Card. If it does not recognize the Memory Card, no status will be displayed on the second line. |

| Problem | Solution |
|---|---|
| Can not recall a stored patient. | Storage of patient data is automatic. Patients are stored by patient ID, when patient data is first entered. To determine what is stored in the Flowmate III's memory:<br>• Connect a printer to the spirometers port.<br>• Turn the printer on.<br>• Press the SUMMARY key at the Main MENU. Make sure the spirometer is customized to the type of printer being used. A list of patients stored by ID number and age will be printed.<br>• Search for the ID of the patient desired (by pressing ENTER repeatedly). |

**NOTE:** The patient storage memory will always discard the earliest patient once the Flowmate III reaches the maximum patient storage. Always print or erase patients in storage. Remember that the Memory Card is only temporary storage for the patients until they are printed. The Memory Card is only an extension of the system memory.

## Printer:

The following is a possible solution for a printer problem.

| Problem | Solution |
|---|---|
| Your printer is not printing when it is connected to your Flowmate III. | The Flowmate III has a specific number of printer drivers to choose from. Printer drivers are instructions to control the format and behavior of your printer when connected to the Flowmate III. If you do not find the selection of your printer in the Customization Routine refer to the printer's user manual. It is possible that your printer can be configured to one of the printer selections provided in the Flowmate III's Customization Routine. Check your printer manual for customization options and configuration instructions. |

# APPENDICES

## Normals Table

One of the principal functions of a spirometer is to determine whether a patient's pulmonary function is normal or abnormal. A "predicted normal" value for a spirometric test index is a "prediction" of the value a patient SHOULD attain if he/she were "normal". The predictions are based on extensive studies of a population done by leading pulmonologists. To obtain predicted values the technician must enter the height, age, sex and race. The spirometric test indices from thousands of people of different height, age, sex and race were analyzed and compiled into an equation. Each normals table is named by the pulmonologist who led the study.

**NORMALS TABLES**

The Flowmate III has normals tables from the following five studies stored in memory. Select the table you want to use in Customizing the Flowmate III on pg. 19. Note the applicable indices and ranges for each study.

**Knudson 1983**

| **INDICES** | SEX | AGE Yrs -Min-max | HEIGHT cm - Min-max | HEIGHT in - Min-max |
|---|---|---|---|---|
| FVC | | | | |
| FEV1 | FEMALE: | 6 - 10 | 106.7 - 147.3 | 42 - 58 |
| FEV1/FVC | | 11 - 19 | 132.1 - 182.9 | 52 - 72 |
| FEF 25-75 | | 20 - 69 | 147.3 - 180.3 | 58 - 71 |
| FEF 50 | | 70 - 87 | 147.3 - 167.6 | 58 - 66 |
| | MALE: | 6 - 11 | 111.8 - 154.9 | 44 - 61 |
| | | 12 - 24 | 139.7 - 193.0 | 55 - 76 |
| | | 25 - 84 | 157.5 - 195.6 | 62 - 77 |

**Crapo**

| **INDICES:** | SEX | AGE Yrs - Min-max | HEIGHT cm. Min-max | HEIGHT in. Min-max |
|---|---|---|---|---|
| FVC | FEMALE | 17-84 | 146-178 | 57-71 |
| FEV1 | MALE | 15-91 | 157-194 | 61-77 |
| FEV3 | | | | |
| FEV1/FVC% | | | | |
| FEF 25-75% | | | | |
| MVV vol | | | | |

**ECCS with Knudson 1983** Children (ages 18 - 24 are evaluated as age 25)

| **INDICES** | SEX | AGE Yrs, Min - max | HEIGHT cm - Min-max | HEIGHT in - Min-max |
|---|---|---|---|---|
| FVC | FEMALE: | 25 - 90 | 145.0 - 180.0 | 56 - 72 |
| FEV1 | CHILDREN: (female) | 6 - 10 | 106.7 - 147.3 | 42 - 58 |
| FEV1/FVC | | 11 - 17 | 132.1 - 182.9 | 52 - 72 |
| FEF 25-75 | MALE: | 25 - 90 | 155.0 - 195.0 | 58 - 80 |
| PEF | CHILDREN: (male) | 6 - 11 | 111.8 - 154.9 | 44 - 61 |
| FEF 50 | | 12 - 17 | 139.7 - 193.0 | 55 - 76 |
| FIVC | | | | |
| MVV vol | | | | |
| VC | | | | |

**Morris**

| **INDICES** | SEX | AGE yrs - Min-max | HEIGHT cm - Min-max | HEIGHT in - Min-max |
|---|---|---|---|---|
| FVC | FEMALE: | 20 - 90 | 145.0-180.0 | 56 - 72 |
| FEV1 | | | | |
| FEV1/FVC | MALE: | 20 - 90 | 155.0-195.0 | 58 - 80 |
| FEF .1 - 1.2 | | | | |
| FEF 25-75 | | | | |
| FEF 75-85 | | | | |

**HSU 1979** (Using Journal of Pediatrics 1979)

| **INDICES** | SEX | AGE yrs- Min-max | HEIGHT cm - Min-max | HEIGHT in - Min-max |
|---|---|---|---|---|
| FVC | FEMALE: | 7 - 20 | 111 - 180 | 43 - 71 |
| FEV1 | MALE: | 7-20 | 111 - 190 | 43 - 75 |
| FEF 25-75 | | | | |
| PEF | | | | |

**LAM 1982**

| **INDICES** | SEX | AGE yrs- Min-max | HEIGHT cm - Min-max | HEIGHT in - Min-max |
|---|---|---|---|---|
| FVC | FEMALE: | 5 - 74 | Height range not specified in study. | Height range not specified in study. |
| FEV1 | MALE: | 5 - 74 | Height range not specified in study. | Height range not specified in study. |
| PEF | | | | |

**COMPOSITE-**
This is the Default normals selection. These normals provide predicted values for most indices.

| INDICES | AUTHOR |
|---|---|
| FVC | Knudson 83 |
| FEV1 | Knudson 83 |
| FEF 50 | Knudson 83 |
| FEV3 | Knudson 83 |
| FEF 25-75 | Knudson 83 |
| FEF 75-85 | Morris |
| PEF | ECCS |
| FIVC | Knudson 83 |
| FIF 50 | No Predicted |
| PIF | No Predicted |
| FEV1/FVC | Knudson 83 |
| FEF 2-1.2 | Morris |
| MVV Vol | Crapo |
| VC | Knudson 83 |

## ATPS and BTPS

**BTPS**: The air in the patient's lungs is said to be "BTPS conditions". BTPS is an abbreviation for Body Temperature, Standard Pressure, and Saturated with water vapor.

**ATPS**: The air measured by the Flow Sensor is said to be at "ATPS conditions". ATPS is an abbreviation for the Ambient Temperature, Standard Pressure, and Saturated with water vapor.

**AUTOMATIC EXPIRATORY BTPS CALCULATION**: The air inside the patient's lungs is at body temperature (98.6 degrees Fahrenheit or 37 degrees Centigrade). A patient exhales into the Flow Sensor, the air cools. As the air cools, it contracts and becomes a smaller volume than it was in the patient's lungs. The volume you want to measure is the larger volume in the patient's lungs, not the smaller volume measured by the Flow Sensor.

To calculate the volume of air in the patient's lungs, the Flowmate III automatically multiplies the volume measured by the Flow Sensor. The correction factor is based on temperature present in the testing room.

**NOTE:** Average Barometric pressure must be entered in Customization Pg. 20.

**AUTOMATIC INSPIRATORY BTPS CALCULATIONS:** The air that the patient inspires through the Flow Sensor is at ambient temperature (the temperature of the immediate surroundings). As the patient inhales through the Flow Sensor, the air heats up in the lungs. As the air heats up it expands and becomes a larger volume than it was before. The volume you want to measure is the larger volume in the patient's lungs, not the smaller volume measured by the Flow Sensor.

To calculate the volume of air in the patient's lungs, the Flowmate III automatically multiplies the volume measured by the Flow Sensor and the BTPS correction factor. The inspiratory BTPS correction factor for the Flowmate III is variable, based on the average air temperature and average standard barometric pressure you entered in the Customization Routine. (See pg. 20).

## BTPS Correction Factors

The Flowmate III automatically corrects to give you BTPS readings. This chart is included for reference purposes only. You calculate the BTPS correction factor by determining the ambient temperature and locating the corresponding BTPS correction factor on this table.

| AMBIENT TEMPERATURE (degrees) | | BTPS EXPIRATORY FACTOR |
|---|---|---|
| C° | F° | |
| 10 | 50.0 | 1.153 |
| 11 | 51.8 | 1.148 |
| 12 | 53.6 | 1.143 |
| 13 | 55.4 | 1.138 |
| 14 | 57.2 | 1.133 |
| 15 | 59.0 | 1.128 |
| 16 | 60.8 | 1.123 |
| 17 | 62.6 | 1.118 |
| 18 | 64.4 | 1.114 |
| 19 | 66.2 | 1.111 |
| 20 | 68.0 | 1.102 |
| 21 | 69.8 | 1.096 |
| 22 | 71.6 | 1.091 |
| 23 | 73.4 | 1.085 |
| 24 | 75.2 | 1.080 |
| 25 | 77.0 | 1.075 |
| 26 | 78.8 | 1.068 |
| 27 | 80.6 | 1.063 |
| 28 | 82.4 | 1.057 |
| 29 | 84.2 | 1.051 |
| 30 | 86.0 | 1.045 |
| 31 | 87.8 | 1.039 |
| 32 | 89.6 | 1.032 |
| 33 | 91.4 | 1.026 |
| 34 | 93.2 | 1.020 |
| 35 | 95.0 | 1.014 |
| 36 | 96.8 | 1.007 |
| 37 | 98.6 | 1.000 |
| 38 | 100.4 | 0.994 |
| 39 | 102.2 | 0.987 |
| 40 | 104.0 | 0.980 |

## Feet / Inches / Centimeters Conversion Chart

| FEET | INCHES | CENTIMETERS | FEET | INCHES | CENTIMETRES |
|---|---|---|---|---|---|
| 3'0" | 36" | 92 | 5'4" | 64" | 163 |
| 3'1" | 37" | 94 | 5'5" | 65" | 165 |
| 3'2" | 38" | 97 | 5'6" | 66" | 168 |
| 3'3" | 39" | 99 | 5'7" | 67" | 171 |
| 3'4" | 40" | 102 | 5'8" | 68" | 173 |
| 3'5" | 41" | 105 | 5'9" | 69" | 176 |
| 3'6" | 42" | 107 | 5'10" | 70" | 178 |
| 3'7" | 43" | 110 | 5'11" | 71" | 181 |
| 3'8" | 44" | 112 | 6'0" | 72" | 183 |
| 3'9" | 45" | 115 | 6'1" | 73" | 186 |
| 3'10" | 46" | 117 | 6'2" | 74" | 188 |
| 3'11" | 47" | 120 | 6'3" | 75" | 191 |
| 4'0" | 48" | 122 | 6'4" | 76" | 193 |
| 4'1" | 49" | 125 | 6'5" | 77" | 196 |
| 4'2" | 50" | 127 | 6'6" | 78" | 198 |
| 4'3" | 51" | 130 | 6'7" | 79" | 201 |
| 4'4" | 52" | 132 | 6'8" | 80" | 204 |
| 4'5" | 53" | 135 | 6'9" | 81" | 206 |
| 4'6" | 54" | 138 | 6'10" | 82" | 209 |
| 4'7" | 55" | 140 | 6'11" | 83" | 211 |
| 4'8" | 56" | 143 | 7'0" | 84" | 214 |
| 4'9" | 57" | 145 | 7'1" | 85" | 216 |
| 4'10" | 58" | 148 | 7'2" | 86" | 219 |
| 4'11" | 59" | 150 | 7'3" | 87" | 221 |
| 5'0" | 60" | 153 | 7'4" | 88" | 224 |
| 5'1" | 61" | 155 | 7'5" | 89" | 226 |
| 5'2" | 62" | 158 | 7'6" | 90" | 229 |
| 5'3" | 63" | 160 | -- | -- | -- |

## Pounds / Kilograms Conversion Chart

| LBS | KGS | LBS | KGS | LBS | KGS | LBS | KGS |
|---|---|---|---|---|---|---|---|
| 50 | 23 | 100 | 45 | 150 | 68 | 200 | 91 |
| 51 | 23 | 101 | 46 | 151 | 69 | 201 | 91 |
| 52 | 24 | 102 | 46 | 152 | 69 | 202 | 92 |
| 53 | 24 | 103 | 47 | 153 | 70 | 203 | 92 |
| 54 | 25 | 104 | 47 | 154 | 70 | 204 | 93 |
| 55 | 25 | 105 | 48 | 155 | 70 | 205 | 93 |
| 56 | 25 | 106 | 48 | 156 | 71 | 206 | 94 |
| 57 | 26 | 107 | 49 | 157 | 71 | 207 | 94 |
| 58 | 26 | 108 | 49 | 158 | 72 | 208 | 95 |
| 59 | 27 | 109 | 50 | 159 | 72 | 209 | 95 |
| 60 | 27 | 110 | 50 | 160 | 73 | 210 | 95 |
| 61 | 28 | 111 | 50 | 161 | 73 | 211 | 96 |
| 62 | 28 | 112 | 51 | 162 | 74 | 212 | 96 |
| 63 | 29 | 113 | 51 | 163 | 74 | 213 | 97 |
| 64 | 29 | 114 | 52 | 164 | 75 | 214 | 97 |
| 65 | 30 | 115 | 52 | 165 | 75 | 215 | 98 |
| 66 | 30 | 116 | 53 | 166 | 75 | 216 | 98 |
| 67 | 30 | 117 | 53 | 167 | 76 | 217 | 99 |
| 68 | 31 | 118 | 54 | 168 | 76 | 218 | 99 |
| 69 | 31 | 119 | 54 | 169 | 77 | 219 | 100 |
| 70 | 32 | 120 | 55 | 170 | 77 | 220 | 100 |
| 71 | 32 | 121 | 55 | 171 | 78 | 221 | 100 |
| 72 | 33 | 122 | 55 | 172 | 78 | 222 | 101 |
| 73 | 33 | 123 | 56 | 173 | 79 | 223 | 101 |
| 74 | 34 | 124 | 56 | 174 | 79 | 224 | 102 |
| 75 | 34 | 125 | 57 | 175 | 80 | 225 | 102 |
| 76 | 35 | 126 | 57 | 176 | 80 | 226 | 103 |
| 77 | 35 | 127 | 58 | 177 | 80 | 227 | 103 |
| 78 | 35 | 128 | 58 | 178 | 81 | 228 | 104 |
| 79 | 36 | 129 | 59 | 179 | 81 | 229 | 104 |
| 80 | 36 | 130 | 59 | 180 | 82 | 230 | 105 |
| 81 | 37 | 131 | 60 | 181 | 82 | 231 | 105 |
| 82 | 37 | 132 | 60 | 182 | 83 | 232 | 105 |
| 83 | 38 | 133 | 60 | 183 | 83 | 233 | 106 |
| 84 | 38 | 134 | 61 | 184 | 84 | 234 | 106 |
| 85 | 39 | 135 | 61 | 185 | 84 | 235 | 107 |
| 86 | 39 | 136 | 62 | 186 | 85 | 236 | 107 |
| 87 | 40 | 137 | 62 | 187 | 85 | 237 | 108 |
| 88 | 40 | 138 | 63 | 188 | 85 | 238 | 108 |
| 89 | 40 | 139 | 63 | 189 | 86 | 239 | 109 |
| 90 | 41 | 140 | 64 | 190 | 86 | 240 | 109 |
| 91 | 41 | 141 | 64 | 191 | 87 | 241 | 110 |
| 92 | 42 | 142 | 65 | 192 | 87 | 242 | 110 |
| 93 | 42 | 143 | 65 | 193 | 88 | 243 | 110 |
| 94 | 43 | 144 | 65 | 194 | 88 | 244 | 111 |
| 95 | 43 | 145 | 66 | 195 | 89 | 245 | 111 |
| 96 | 44 | 146 | 66 | 196 | 89 | 246 | 112 |
| 97 | 44 | 147 | 67 | 197 | 90 | 247 | 112 |
| 98 | 45 | 148 | 67 | 198 | 90 | 248 | 113 |
| 99 | 45 | 149 | 68 | 199 | 90 | 249 | 113 |

## Sample Test Reports

The following reports are samples of some of the test reports available with the Flowmate III spirometer. Some patient data can be included or excluded on these reports. (See Customization pg. 18).

PATIENT DATA and TEST CONDITIONS

Name : _____ 02/27/98 09:28
ID No.: 123/45/6789 55 years male caucasian
70 in. 175 lbs. 0 cigarettes per day

Tech. : _____
Ambient Conditions: 760 mm Hg at 22.2 C
Last Calibration : 02/25/98 Selected Normals : Composite

Doctor: _____

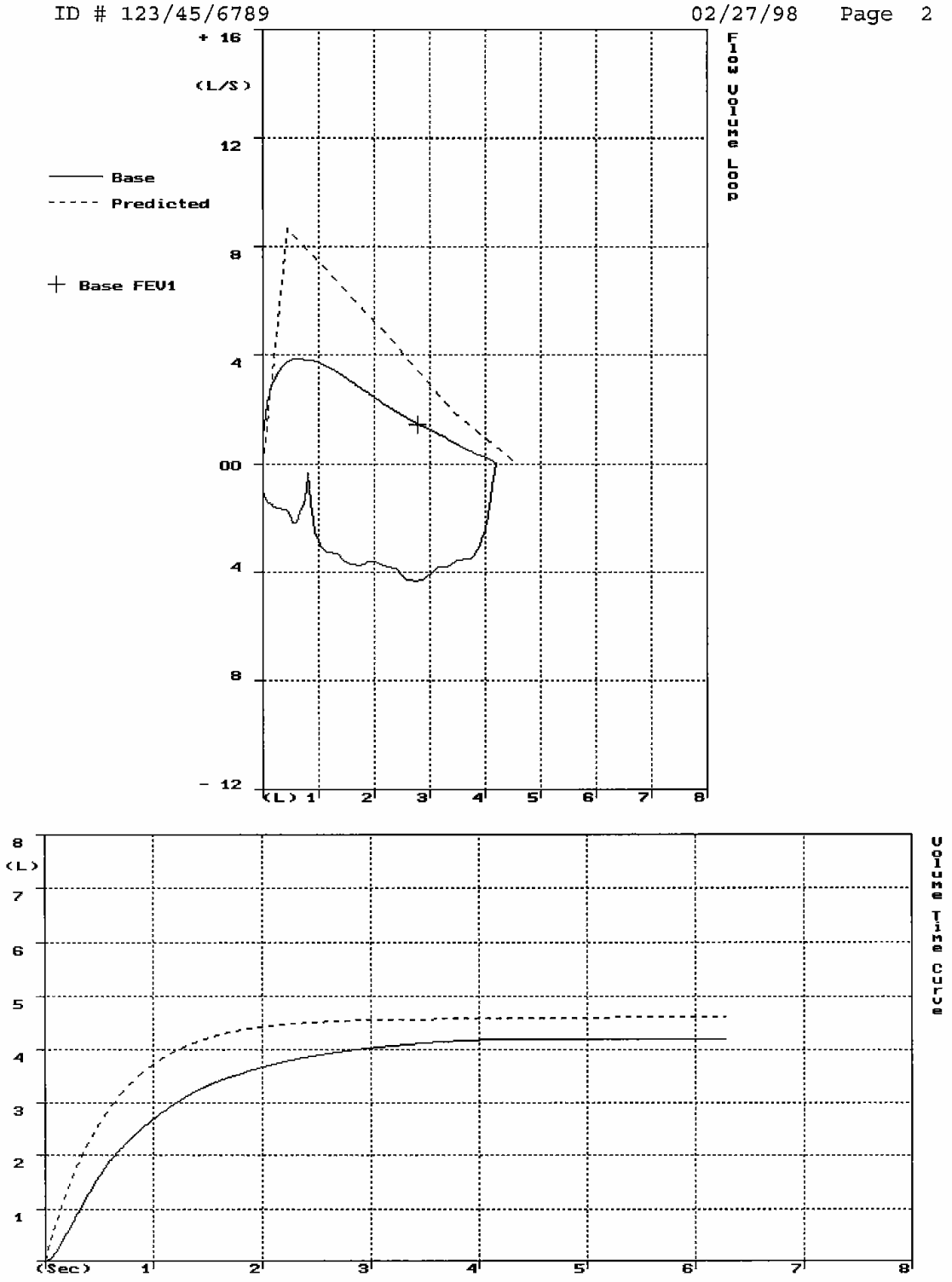
---

Test No. 01 FVC 02/27/98 09:28

| Index | Unt | Meas | Pred | %Pred | %Var |
|---|---|---|---|---|---|
| FVC | L | 4.21 | 4.59 | 92 | 0.0 |
| FEV 1 | L | 2.80 | 3.70 | 76 | 0.0 |
| FEV1/FVC | % | 66.5 | 80.9 | 82 | 0.0 |
| FEF25-75 | L/S | 2.1 | 3.8 | 55 | 0.0 |
| PEF | L/S | 3.9 | 8.7 | 45 | 0.0 |

Forced Expiratory Time: 6.3 sec

---


ID # 123/45/6789
02/27/98 Page 2
+ 16
(L/S)
12
8
4
00
4
8
- 12
Base
Predicted
Base FEV1
Flow Volume Loop
(L) 1 2 3 4 5 6 7 8
8
(L)
7
6
5
4
3
2
1
(Sec) 1 2 3 4 5 6 7 8
Volume Time Curve

Page 1

PATIENT DATA and TEST CONDITIONS
[Post Bronchodilator]

Name : _____ 02/20/98 03:21
ID No.: 000/00/0000 29 years female caucasian
67 in. 125 lbs. 20 cigarettes per day

Tech. : _____
Ambient Conditions: 760 mm Hg at 22.2 C
Last Calibration : 02/11/98 Selected Normals : Composite

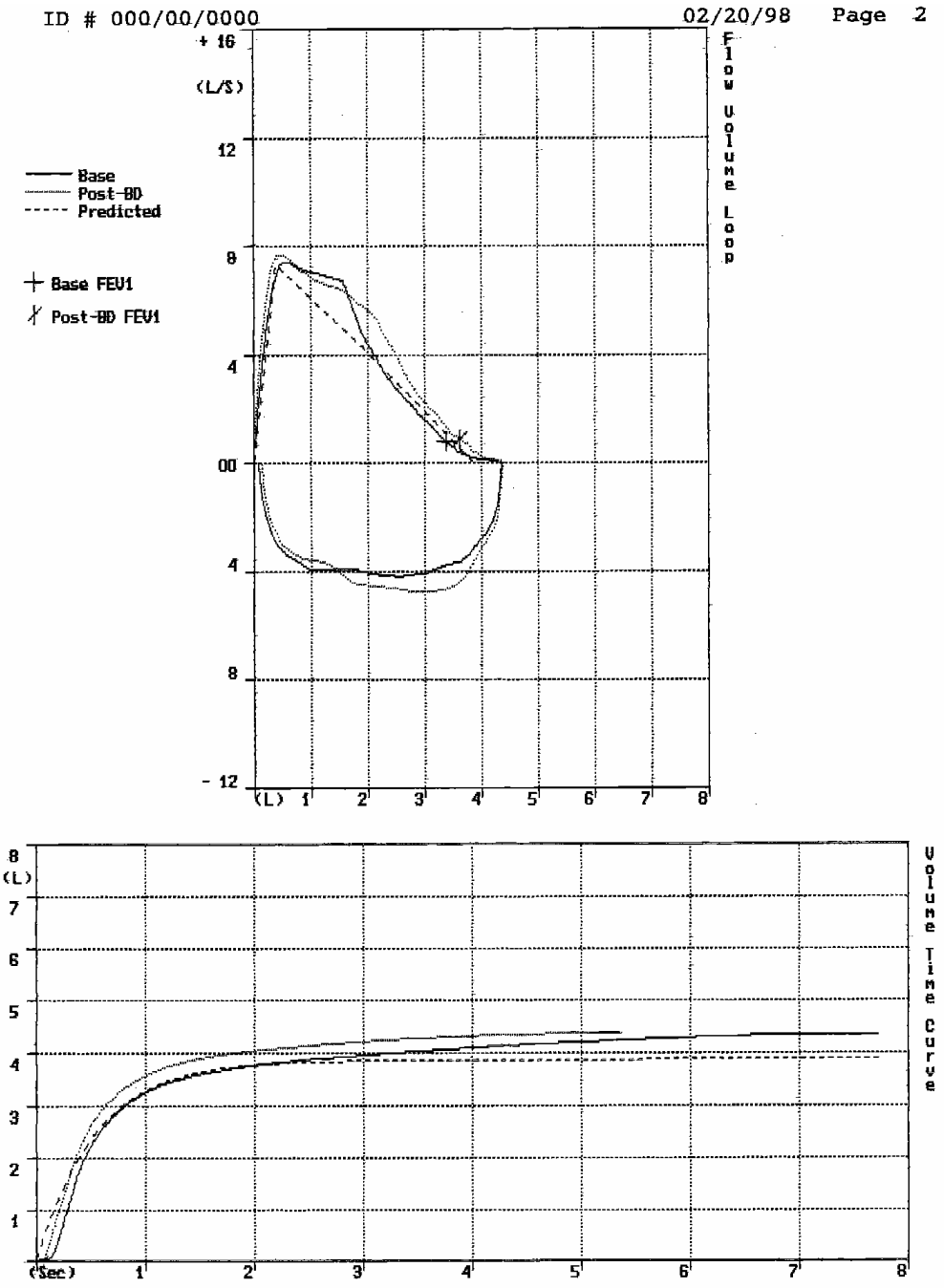
Doctor: _____

Best Test Summary Tests 01-07 02/20/98

| Index | | No | Meas | Pred | %Pred | %Var | No | POST | %Pred | %Var | %Diff |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FVC | L | 02 | 4.37 | 3.87 | 113 | 1.6 | 07 | 4.38 | 113 | 0.9 | + 0.2 |
| FEV 1 | L | 03 | 3.45 | 3.28 | 105 | 0.3 | 07 | 3.64 | 111 | 3.0 | + 5.5 |
| FEV1/FVC | % | -- | 78.9 | 84.7 | 93 | 1.4 | -- | 83.1 | 98 | 2.2 | + 5.3 |
| FEF25-75 | L/S | 02 | 3.0 | 3.8 | 79 | 16.7 | 07 | 3.9 | 103 | 7.7 | + 30.0 |
| PEF | L/S | 02 | 7.5 | 7.4 | 101 | 10.7 | 07 | 7.8 | 105 | 3.8 | + 4.0 |

Spirometric results appear normal
Risk of COPD : 1% -
Risk if smoking stopped: 1% -
Estimated lung age: 23 years

Curve selection from Test(s) # 02, 07 with greatest FVC + FEV1.


ID # 000/00/0000
02/20/98 Page 2
+ 16
(L/S)
12
8
4
00
4
8
- 12
(L) 1 2 3 4 5 6 7 8
Flow Volume Loop
Base
Post-BD
Predicted
Base FEV1
Post-BD FEV1
8
(L)
7
6
5
4
3
2
1
(Sec) 1 2 3 4 5 6 7 8
Volume Time Curve

# SPECIFICATIONS

**PHYSICAL**

| | | | |
|---|---|---|---|
| **Height** | - | 2.25 inches | ( 5.7 cm) |
| **Depth** | - | 5.50 inches | (14.0 cm) |
| **Width** | - | 9.0 inches | (22.9 cm) |
| **Weight** | - | 2 Lbs | (0.9 kg) |

**POWER REQUIREMENTS**

**Battery & AC-**

Requires 6 1.2 volt AA NiCad batteries
500 mhr; AC adapter is a UL 544 recognized 9 volts DC at 1 amp; Power consumption is 200 Milliamps in operation; Battery recharge time is 15 hrs which provides 4.5 hrs of continuous use under battery power.

**Amperage-**

200 Milliamps in use.

**Electrical Requirements-**

Meets UL544 requirements, AC Adapter provided. Plugs into any standard 120 VAC 60 Hz

**ENVIRONMENTAL-**

**Temperature-**

| | | |
|---|---|---|
| Operating range | $50^0$F-$104^0$F | $10^0$C-$40^0$C |
| Max storage temperature | $40^0$F-$110^0$F | $5^0$C-$46^0$C |

**USER INTERFACE-**

| | |
|---|---|
| **Display-** | 2 line by 40 character LCD display |
| **Keypad-** | 20 key membrane switch with audible feedback |

**PATIENT DATA-** (Verification report is printed after entering all patient data.)

| | |
|---|---|
| **ID number-** | Up to 16 digits (incl. '/' and "." ) |
| **Age-** | Up to 3 digits |
| **Sex-** | Male, Female |
| **Race-** | Caucasian, Black, Other |
| **Height-** | Up to 3 digits, 36 to 89 inches; 90 to 250 centimeters automatically determines units of measurement |
| **Weight** | Up to 3 digits (optional); Selectable as Lbs or Kgs |

**TEST-**

| | |
|---|---|
| **Maneuvers-** | FVC maneuver<br>MVV maneuver<br>VC maneuver<br>Methacholine Challenge (Inhalation Challenge Maneuver) |

**INDICES CALCULATED-**

**FVC Maneuver-**

| | |
|---|---|
| FVC | Forced Vital Capacity |
| FEV1 | Forced Expiratory Vol-1 sec |
| FEV3 | * Forced Expiratory Vol-3 sec |
| FEV1/FVC% | FEV1 Ratio |
| FEF 25-75 | Mid Expiratory Flow Rate |
| FEF 75-85 | * Late Expiratory Flow Rate |
| FEF 200-1200 | * Forced Expiratory Flow Rate in between 200ml 1200ml |
| PEF | Peak Expiratory Flow Rate |
| FEF50 | * Forced Expiratory Flow Rate at 50% of FVC |
| FIVC | * Forced Inspiratory Vital Capacity |
| FIF50 | * Forced Inspiratory Flow at 50% of FIVC |
| FEF50/FIF50% | * Ratio of FEF50 to FIF50 |
| PIF | * Peak Inspiratory Flow |
| COPD | (Chronic Obstructive Pulmonary Disease) Risk Assessment |

* These indices appear only on expanded reports

**FEV Timing-**

FEV timings based on back extrapolation

**MVV Maneuver-**

| | |
|---|---|
| MVV volume | Minute expired volume |
| MVV rate | Breaths per minute |

**VC Maneuver-**

| | |
|---|---|
| VC | Vital capacity |
| ATI | Air Trapping Index |

| | |
|---|---|
| **Max Volume-** | 10 liters |
| **Max Flow Rate-** | +/- 16 liters/sec |
| **Accuracy-** | +/- 3% of reading |
| **Resolution-** | 1ml/Sec/LSB (12 Bit A/D) |
| **Sampling Rate-** | 150 HZ |
| **Back Pressure-** | Less than 1.5 cm H2O/L/S |

**BTPS CONVERSION-** (Calculated in real time)

**User Input Temp-** **5**0 to 104 F
10 to 40 C
Automatically determines units

**User Input Pressure-** 20-35 inches of mercury 500-900 millimeters of mercury automatically determines units.

**VALIDITY DETERMINATION-** (Pertinent only for the FVC trials)

**Best FVC-** Largest, regardless of trace

**Best FEV1-** Largest, regardless of trace

**Best Ratio-** Best FEV1/Best FVC

**Best Flow Rates-** Taken from trace with greatest sum of FVC and FEV1

**Patient Effort-** Requires clinician to evaluate acceptable or unacceptable patient effort. Discards unacceptable trials upon answering NO to "Was the Patient effort acceptable".

**Variability-** Compares indices of current test with best in memory; displays and prints variability as % deviation. Variability greater than 5% for FVC and FEV1 is regarded as poor reproducibility; prints message.

**Expiratory Time-** If forced expiratory time is:
Less than 6 seconds a "TEST was short but OK, Blow Longer" message will be displayed.
A less than 1 second TEST is not accepted because it is too short.

**Extrapolated Vol-** If extrapolated volume is greater than 5% of FVC a "SLOW START" message will be displayed.

**CHOICE OF NORMALS-**

Composite
Knudson (incl. pediatrics)
Crapo (ITS)
ECCS
HSU
MORRIS
LAM
Knudson76 is an available option – Call Inside Sales to inquire

**INTERPRETATIONS-** Obstruction, Restriction, or Abnormality

**GRAPHIC OUTPUT-** ATS specification for Time Scale, Volume Scale & Flow rate Scale

**PRINTER-** External Printer with selectable drivers (optional)

**Reports-** Standard 81/2" X 11" paper printed reports; Automatic printout after each trial (selectable).

**INPUT/OUTPUT COMMUNICATION PORTS**

| | |
|---|---|
| **Serial-** | RS232 I/O port is a custom modular jack handshake (CTS/RTS or DTR/DSR); Port Use: Sensor connection. |
| **Parallel-** | Standard DB-25 Female IBM PC pin out. Connects to printers using standard centronics Parallel type interface. |
| **Data Format-** | Proprietary to Spirometrics |
| **Number of Patients-** | 5 Patients; optional RAM CARD 118 Patients |
| **FVC-** | 6 trials each patient (3 Pre-, 3 Post) |
| **MVV-** | 2 trials each patient (1 Pre-, 1 Post) |
| **VC-** | 6 trials each patient (3 Pre-, 3 Post) |
| **Internal RAM-** | Size 128k Bytes<br>Battery backup Internal RAM |
| **Memory Card-** | Accepts a 68 pin battery backup 512 Kilobytes RAM CARD compatible with PCMCIA 2.0 connection. |

**TEST NUMBERING-**

Numbers each patient's trials consecutively regardless of type (for recall)

**CALENDAR /CLOCK-** (Stamps time and date on test reports)

| | |
|---|---|
| **Time-** | Selectable as 12 or 24 hr scale |
| **Date-** | American - MM/DD/YY<br>European - DD/MM/YY |

**INSTRUMENT CALIBRATION**

| | |
|---|---|
| **Syringe-** | Selectable 1-9 liters (ATPS); default is 3 liters |
| **Routine-** | Display leads user through routine; Calibration reports printout automatically. |

## ACCESSORIES + REORDER INFORMATION

The following is a list of accessories and model numbers for the Flowmate III Spirometry System.

| Description | Model # |
|---|---|
| Flowmate III Portable Spirometer | 2500LTE |
| Patient Data Memory Card | 2122 |
| Nose Clips (Pkg. of 100) | 2104 |
| Filter, Disposable - Single Patient Use (Box of 100) | 2195 |
| 3-Liter Calibration Syringe | 2125 |
| Adapter Seal, Calibration Syringe | 30-0015 |
| Spirometer, EASY CLEAN Cartridge (Flowmate III) | 18225 |
| Printer Cable | 3355 |
| Re-Chargeable NiCad Batteries (Requires 6) | 15120 |
| Spirometer, AC Adapter | 18002 |
| Flowmate III Operator's Manual | M2500III |
| Coiled Cord | 15027 |

Call your local distributor for more information on Flowmate III Accessories.

Printers available through Spirometrics
Please contact Inside Sales for complete computer / printer options.

**207-657-6700**
or
**800-767-0004**

**Fax 207-657-4123**

**www.spirometrics.com**

**email spiro@spirometrics.com**